POPULAR MECHANICS

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ELECTRIC LIGHTED BREECHES BUOY

First Improvement in 100 Years

Few people are aware that the breeches buoy employed by all life-saving stations the world over has been in use for 100 years; and no less surprising is the fact that until now no improvement in its construction has been made in all that time. When the lifeboat cannot go out, a light line is shot from a cannon on shore over the wreck, where it is seized by the sailors who use it to draw out a heavier line which is made fast to the ship. On this line the breeches buoy is drawn back and forth with a light line, the outfit being suspended from a trolley which travels on the big rope. The buoy consists of a cork round life preserver to which is attached short breeches of stout canvas—hence the name. One passenger can be taken at each trip. Inasmuch as rescues with this apparatus are most often made at night, great difficulty is experienced by the crew on shore in knowing when the buoy has reached the ship, or is loaded ready to return; and frequently passengers are nearly drowned in the waves by being stopped after getting a few yards from the ship. Even when the men on shore keep pulling, the occupant is tossed up, his head striking against the heavy iron trolley.

The new device has an air cushion to protect the head, and a box containing an electric battery which will burn for 24 hours. Water or wind has no effect whatever upon the lights, which are the important improvement making signals possible for the first time. There are three bull's-eye lights; a white one shining down on the breeches buoy; a green light burns on the sea side, and a white light shows on the shore side so long as the buoy is empty. The moment a person gets into the breeches the light automatically changes to red, which is the signal to "haul away."

Courtesy American Shipbuilder

Latest Style in Breeches Buoy

The apparatus which has been tested with great success, is the invention of a Captain Dalton, of Cape Cod, an expert in life-saving work, and is the result of a wreck two years ago in which every person on board the ship was lost. It has been adopted by the U. S. Life-Saving Service.

STRENGTH OF TELEPHONE WIRES

In switching some freight cars on to a siding at North Haven, Conn., the brakes failed to work and a car ran off the end of the track and crashed through a big 50-ft. telephone pole, breaking it at the ground and at a point 25 ft. high. For a few moments that part of the pole left swinging in the air danced up and down like the bobber on a fish line, and threatened to bring down the line. The wires however proved equal to the strain and for several days the unusual sight was a curiosity to hundreds of people. After breaking the pole the car went on and stopped right in front of a house, which would surely have been wrecked but for the fortunate location of the pole. The owner now thinks telephone poles good things to have around a man's house. The picture is reproduced by courtesy of the American Telephone Journal, from a photograph made by John Putnam.

"Swinging in Mid-Air"

ATLANTIC OCEAN TRAFFIC

During 1906, there were 1,097 landings of trans-Atlantic liners at New York, bringing to this side a total of 1,159,551 passengers, and for the first time exceeding the million mark. Of these passengers 218,720 were cabin and 940,831 steerage. The latter figures are especially noteworthy in view of the now stringent immigration laws, and absence of rate cutting on the Atlantic.

There were 15 steamship lines whose vessels averaged over 1,000 passengers per trip west during the entire year, while certain favorite lines averaged over 2,000 passengers per boat per trip.

LIPTON'S NEW 50-HP. MOTOR BOAT

Sir Thomas Lipton has just received from the builders, White Bros. of Southampton, England, a new motor boat, which he has named "Britannia 1." She is 50 hp. and has a speed of 14 knots which can be maintained in the roughest weather or any kind of a heavy sea. She is 55 ft. long and has two 6-cylinder 50 hp. motors, turning twin screws. The motors are built by the Britannia Engineering Company, of Colchester, who designed the above arrangement to eliminate all vibration. Sir Thomas' new boat is probably the smoothest running motor boat yet built for one not equipped with electric power.

The saloon is a handsomely furnished apartment, with ceiling high enough for the tall owner to move about without stooping. Pantry,

"Britannia No. 1"—50 Hp.

kitchen and lavatory are located near the saloon. Under the forward deck, in the engine room are two folding beds for the engineer and assistant.

PUSH BUTTON OPERATES MORRIS CHAIR

The latest ease producer is a Morris chair which tilts backward or forward

No Exertion to Operate

as much or little as desired without getting up to set the rod. In fact there is no rod, but instead a series of stops controlled by a push button. You simply touch the button and the weight of the body carries the back to any angle wanted; sit up straight and touch the button again and the chair straightens up at the same instant.

LEARN SPANISH; NOT GREEK

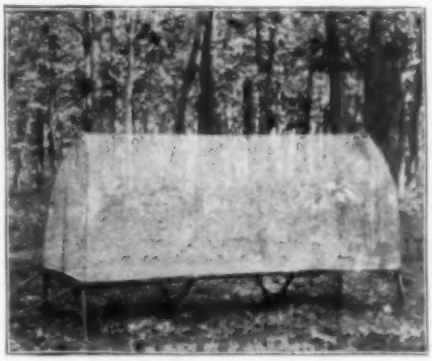
Spanish is the language of commerce in the Western Hemisphere, hence a young man had far better learn Spanish than Greek, unless he intends to devote his life to study, in which event he would master both.

The commercial possibilities of the immediate future with the Latin speaking countries which are just coming as purchasers into the markets of the world, are beyond compute. Spanish is the most useful foreign language a young American can learn. Not only is it essential to a traveling representative or resident agent in the Latin-American countries, but there is a great demand at home for stenographers, correspondents, and export department clerks and managers, each of whom are able to command very much larger salaries by reason of their knowledge of Spanish, than is paid to corresponding positions in the same establishments to their English speaking and writing employes.

The Latin countries will be slow to change either their custom or language, and if we are to do business with them we must learn their language; not wait for them to learn ours.

SPORTSMAN'S PORTABLE BED

A bed 6 ft. long and 28 in. wide, made of canvas and collapsible metal frames, and weighing only 6 lb. is now available for campers. The entire outfit folds into a package only 14 in. long, which can be packed in a trunk

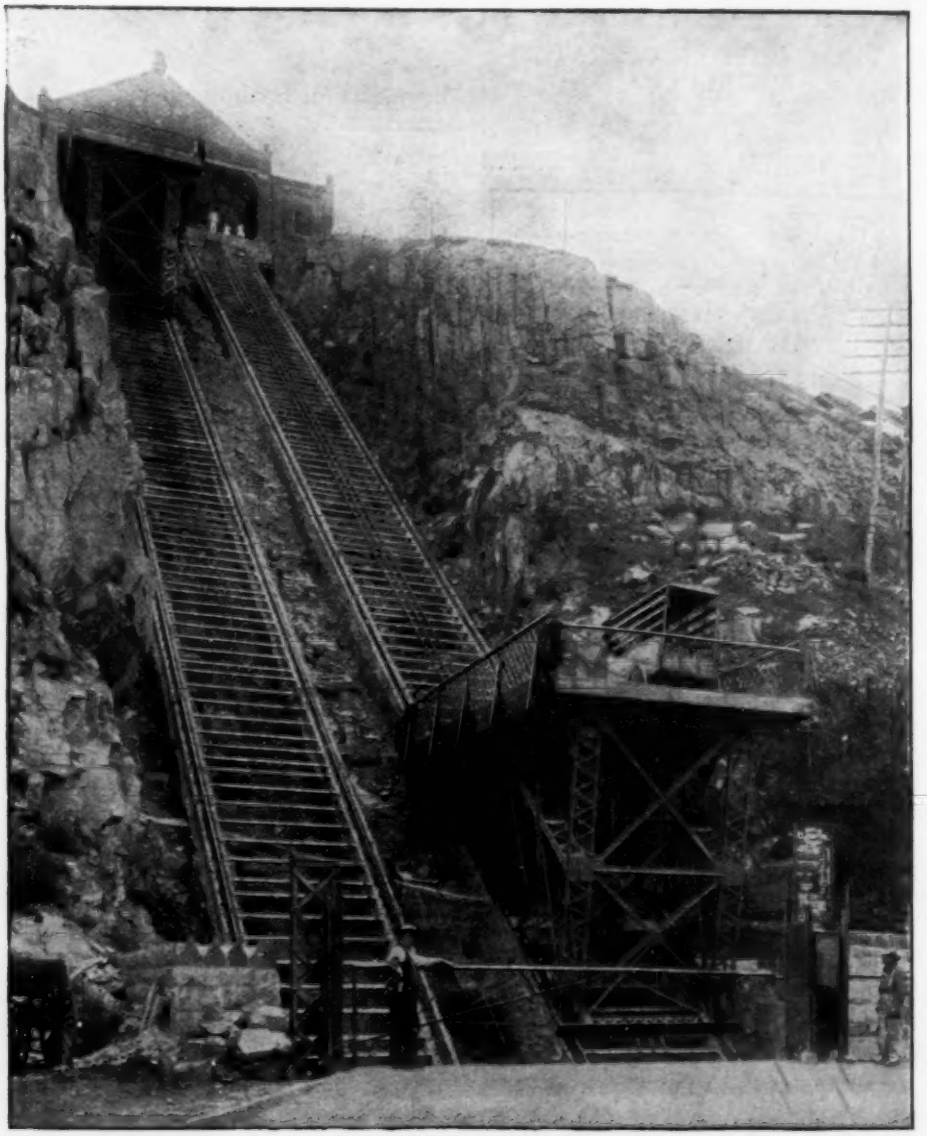


Shuts out Insects and Rain

or slung over the shoulder. The bed proper does not touch the ground, and a light wire frame supports mosquito netting, which shuts out all insects, or in event of cold or rain a blanket or canvas may be used as a roof. The bed can be set up or taken down in a few minutes.

A clearing house to look after the 2,000,000 freight cars of leading roads will be established at Chicago.

RAILROAD HAS 72 PER CENT GRADE



Incline Plane Railway—Capacity 25 Tons

At Weehawken, New Jersey, there is one of the queerest railways ever built. It is a 300-ft. incline with a grade of 72 per cent. Cars 20 ft. wide and 40 ft. long capable of carrying a load of 50,000 lb. are used on the line. These cars are operated by 300-hp. electric motors and make the ascent in one minute. Both passengers and vehicles are carried.

MODERN DIVING BELLS

A Submerged Workshop—Contains Several Men—Built of Strongest Steel

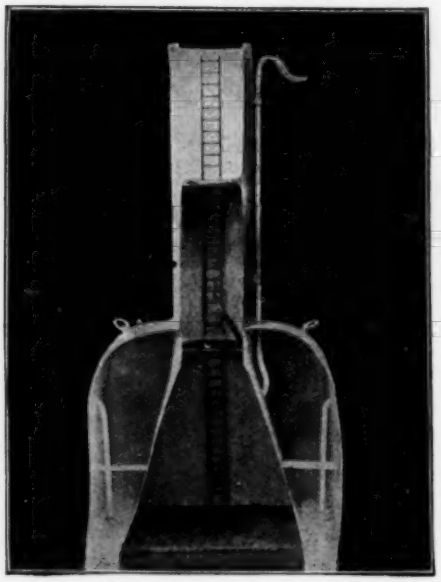
[For the facts and photographs used in the preparation of this article the editor is indebted to Messrs. Siebe, Gorman & Co., Submarine Engineers to the British Admiralty and War Office.]

In this country we are accustomed to think of the diving bell as a relic of antiquity dating back, as it does, several hundred years from our first book in physics. Our submarine work is done by divers clad in armor and helmet, but in other countries the modern diving bell finds frequent use, and has been brought to a remarkable state of efficiency.

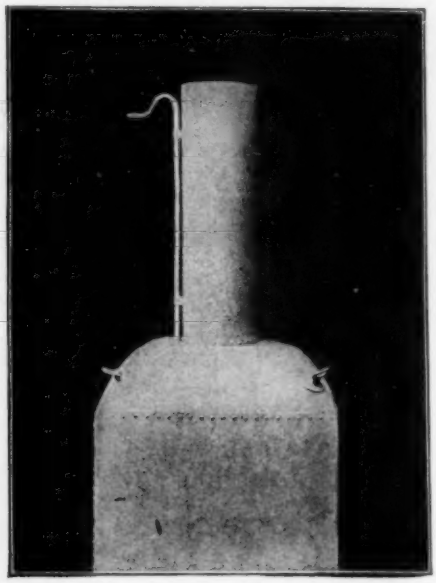
The early diving bells were formed of wood bound with iron hoops like a barrel. They could go down only to moderate depths and remain but a short time, "as the air contained was about 60 gal." When this was exhausted the diver became insensible and, if not drawn up and released, soon died. At 33 ft. the pressure half filled the bell with water. About 1720 the first improvement in air supply was made by Dr. Halley, secretary of the Royal Society, who with four others descended to a depth of 60 ft. and remained down one hour and forty-five minutes without discomfort. He arranged a number of casks, coated with lead to sink them, "each containing 36 gal. of air." These casks one at a time were drawn down by a rope, and the air they contained transferred to the diving bell by means of a leathern hose. The hot air in the bell was released through a small valve at the top. In 1778 the first use of an

Single Diving Bell

Double Bell for Japan



Interior of Air-Lock Diving Bell—For Gibraltar



Exterior of Air-Lock Diving Bell—Illustration Greatly Reduced

air compressor on the surface to pump air down to the bell was successfully employed at Hexam Bridge, England, where two men remained under water for hours at a time. The diver's dress and helmet was invented in 1829.

The modern bell is of two types—the "diving bell," which can be let down from a dock or float, and the "air lock," which is built into a vessel specially constructed for the purpose.

The ordinary diving bell measures 8 ft. long, 6 ft. wide and 5½ ft. high inside. It is a steel box open at the bottom, with heavy glass bull's-eye windows to admit light through the top. To it are fastened four chain slings which terminate in a single chain with which the bell is lowered and raised. Every possible precaution and test is applied in the making of these chains. From the center at the top stretches the air hose and telephone and electric light wires extending to the air pumps above. Within the bell around the bottom are the blocks of cast-iron ballast, seats and footrails for the divers, and shelves and hooks for tools. A chain hoist hangs from the center of the ceiling, while the electric lights are attached in several convenient places. This outfit permits two or more men to work together, assisting each other, and with a freedom of motion which is impossible to the diver clad in armor, weighted down with diving weights, and with the resistance of water, and often tide, to contend with. The men in the bell need give no thought to their safety, nor constantly guard against the fouling or kinking of the air hose, as the diver in the helmet suit must constantly do. Even if the air pump should fail there is always sufficient air to sustain life until the bell can be raised and in extreme emergency the occupants could take chances on diving into the water through the open bottom and possibly reach the surface alive.

The largest diving bell ever constructed is pictured in the illustration, the interior measurements being: Length, 17 ft.; width, 10 ft. 6 in., and height, 6 ft. 6 in. It has straight sides permitting close approach to the work on which it is employed. It has a large complement of tools of all kinds, chain hoists, hooks, etc., and its telephone has an extra loud trans-

mitter by which the conversation of the crew can be heard at all times, and to call above does not compel stopping work. The air supply required is large and air compressors worked by steam engines are necessary. As an additional precaution the pumps deliver their air into a large steel tank which contains a reserve supply lasting 30 minutes. The hoisting of the bell is done with a steam engine.

The air lock diving bell is a large affair and is used for heavy and extended work on the bottom, such as rock drilling, building masonry piers, and undertakings requiring considerable time. It is really a steel caisson with one or more air locks opening through a large steel tube, which rises to the open air through a well built in the middle of the boat. The apparatus is raised and lowered from a tall steel platform resting on four legs, by means of steel cables on drums driven by powerful engines; counter-weights assist in the movement.

The air lock diving bell plant illustrated was built for use of the British admiralty at Gibraltar. The vessel is 85 ft. long, 40 ft. beam; the diving bell weighing 50 tons, and in addition to all the usual equipment of the ordinary diving bells contains a rock drill operated by compressed air. There is a large opening in the lower chamber out of which the water is kept by maintaining the necessary air pressure. The workmen can ascend at any time by climbing the ladder. When a man has occasion to come up he enters the air lock chamber, locks the bottom door to maintain the pressure below, remains in the lock a few minutes during which time the air pressure is gradually reduced until there is none at all, then he passes through the upper door into the tube and so on up to the top and reaches the platform. To re-enter the diving bell this procedure is reversed.

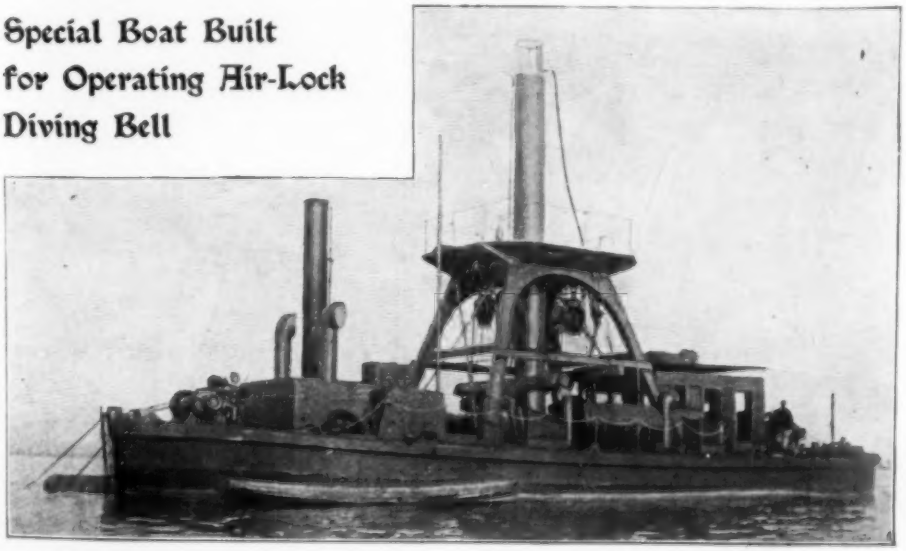
For the most part, however, submarine work is done by helmet divers in closed suits, and some of their most important and exciting experiences in the recovery of vast treasures will be related next month.

(To be continued.)

The Pennsylvania railroad has planted 1,500,000 trees along its right of way during the past five years.

Iron sheets coated with aluminum are very durable and likely to supplant galvanized iron for many purposes.

Special Boat Built for Operating Air-Lock Diving Bell



Entering Banquet Hall

BANQUET ON CHIMNEY TOP

When the new brick chimney of a hotel at Atlantic City, N. J., was completed recently, the chief engineer of the hotel celebrated the event with a banquet in mid-air. A platform was built inside the chimney, at the top, and the dishes and other things were hauled up with ropes. The guests were required to "step in to dinner" by climbing the iron ladder on the outside of the stack a little matter of 150 ft. The host, weighing 206 lb., led the way to the novel dining room. The Practical Engineer says there were eight in the party and all ate heartily.

THE FUTURE TELEGRAPH SYSTEM

The bulk of the telegraphing in the world is in the Morse code, using the Morse key and sounder with few changes from the original. The reliability of the old system is what has maintained its supremacy, but there must soon come more rapid facilities, says W. J. White, in the London Electrical Review. The trouble with the typewriting systems is the difficulty of synchronizing. The machine telegraph of the future must remedy this; the ideal being one in which any typewriter operator can send a message, and the instrument at the other end will print in Roman characters what is sent.

The prediction is made that big business houses will have their private telegraph lines to the nearest office, a typewriter telegraph instrument being placed on the desk. An operator will write messages previously dictated. These will be received on a printing machine at the main office. An indicator will warn the operator there that the message is waiting. It will be taken from the receiver and despatched to its destination without delay. In a few moments the merchant for whom it is intended will receive a signal on the instrument in his office and, going to it, will get the message.

DRIVING SHIPS BY ELECTRIC MOTORS

Will the electric motor yet find a place in the propelling plant of big ocean steamers? There are those who say it will; one is a naval constructor writing in the Shipping World, London. He points out the difficulty of graduated speeds and reverses

with the present steam turbine, while recognizing their many advantages. His expectation is that the turbines will not be connected to the driving shafts, but be of the vertical type driving generators. The current will be led through cables to motors direct connected to the propeller shafts. Steam would then be used economically—which it is not now—in driving the turbines, and the ease with which various speeds, or reverse for going astern could be accomplished is evident.

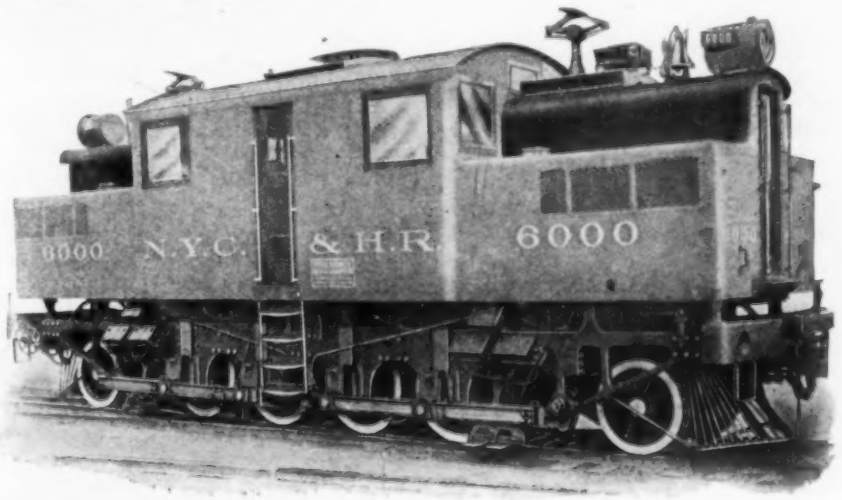
THE N. Y. CENTRAL DISASTER

One of the strangest accidents which ever befell a passenger train was the overturning of the suburban electric on the New York Central on its run out of New York City on the evening of February 16. When rounding a curve while going at a speed estimated to be from 70 to 90 miles an hour, one coach after another, beginning with the rear car, toppled over and were wrecked. The dead numbered 23 and the injured 100 or more. The heavy electric locomotive did not leave the track when brought to a stop after scattering passengers and pieces of cars along the track for several hundred feet. The accident was a mechanical crack-the-whip, and the electric locomotive was apparently responsible in that it was capable of enormous speed.

One of the railroad employes testified at the inquest he found the end of one rail sprung sideways 5 in. This, however, would seem to have been a result of the accident rather than its cause, for the rear car was the first to tip over.

It is difficult to find any excuse for the disaster, which would seem to be the result of the motorman trying to see how fast he could go; and in the matter of speed an electric car is very obedient.

There certainly was no pressing need for any such haste in a suburban train, and had the cars been of steel instead of light, flimsy wooden affairs, the dead and injured list would have been greatly reduced. Railroads resent state and national supervision, but the terrible and constantly recurring disasters of the past four months cannot be long continued without arousing public opinion to a point where very stringent legislation will not only be demanded, but enacted.



High-Speed Electric Locomotive

In the November issue of this magazine figures from the Inter-State

Commerce Commission were published, showing that the percentage of passengers killed last year is more than double that of 10 years ago, while the injured are fully three times more. In other words it was more than twice as safe to travel on steam roads 10 years ago than it is today.

We repeat the question asked then: "Why is it?"

PICKING CORN BY MACHINERY

It is only within the last few years that anything practical in the way of machines for picking corn have been produced. Now there are several successful machines on the market, the one illustrated being a good type of all.

This picker has the guide chains with the usual prongs for straightening up the stalks. The chains form a stalk passage extending rearward through the machine. A rapidly moving chain provided with fingers is located at one side and between the guide chains in such a position that as the machine passes over the row the fingers engage the ears on the stalks and snap them off. By means of a deflector the ears are directed to a receptacle from which they are carried to the husking rollers and thence to the wagon. The tops of the cornstalks are cut off, and by means of a conveyer this and other trash is carried to the rear and dropped on the ground.

The great objection to all modern corn pickers is that the stalks are assumed to be valueless, and are practically destroyed; while every economical farmer nowadays secures his fodder with as much care as he gives his hay, knowing that it is equally nutritious.

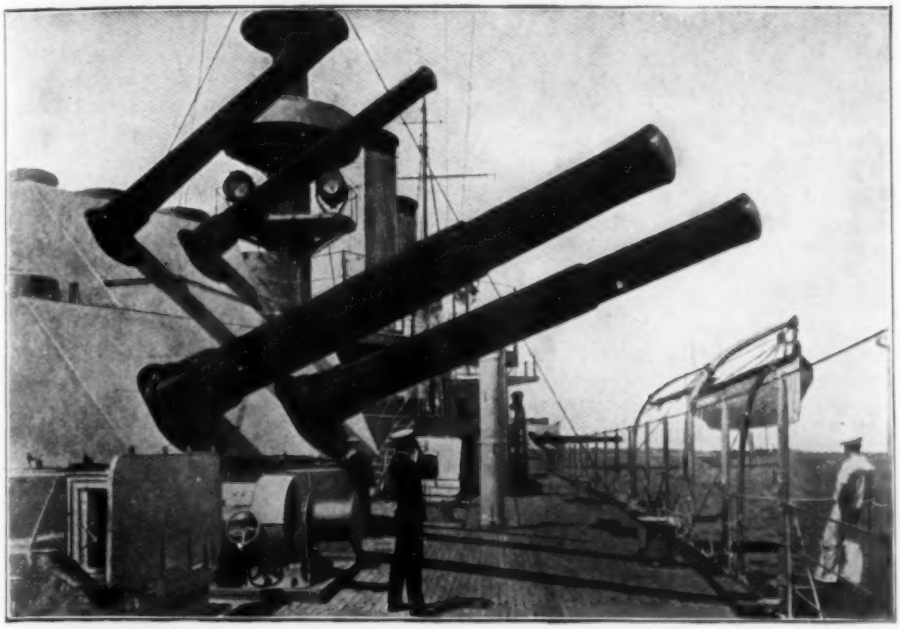
Modern Machine for Picking Corn

LEAD-GNAWING BUGS

In many tropical countries the engineers have been obliged to use iron telegraph poles because ferocious ants speedily destroyed the wooden ones. But right here in Chicago has been found an innocent looking bug with an appetite for lead pipe, and it thinks nothing of eating through the lead covering of an underground telephone

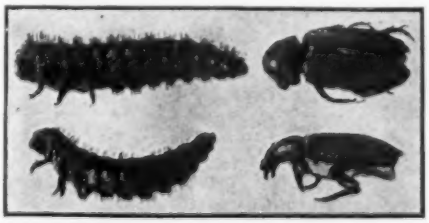
Lead Pipe Showing Ravages of Bugs

cable. It is believed it is the insulating material within the lead pipe which the beetle really craves, but this would indicate a possession of an x-ray eyesight or a wonderfully keen sense of smell. In any event the bug gnaws through the lead pipe, whether it actually eats the lead or not. The insect was discovered by experts from the Underwriters Laboratories of Chicago, in an investigation of trouble on fire alarm wires at the stockyards. Wires in the "bone-house" seem to have fared the worst, and the discovery opens up



THE BATTLESHIP "NEW JERSEY" is remarkable for her double turrets fore and aft, in each of which are mounted two 8-in. and two 12-in. guns. She carries in all 64 guns; is 435 ft. long; 76 ft. 10 in. beam; has 19,000 h. p.; speed, 19 knots; displacement, 15,320 tons; requires 703 men.

possibilities of danger heretofore undreamed of, for the question instantly arises: Can any lead covering of electric light wires be pronounced absolutely secure from leakage of current and consequent fires?



Insects That Gnaw Lead

A similar case is reported from Savannah, in this country; and from many parts of Australia where trouble of this kind has become common. The Australian bug is known to the general public as the Jesuit beetle. Another, the elephant beetle, is also addicted to lead gnawing. A covering of aluminum is now suggested as likely to resist the bug bites, but no one can tell how long this will answer, as Nature is a great provider for necessities, and the bugs may grow a new set of teeth specially adapted to an aluminum diet.

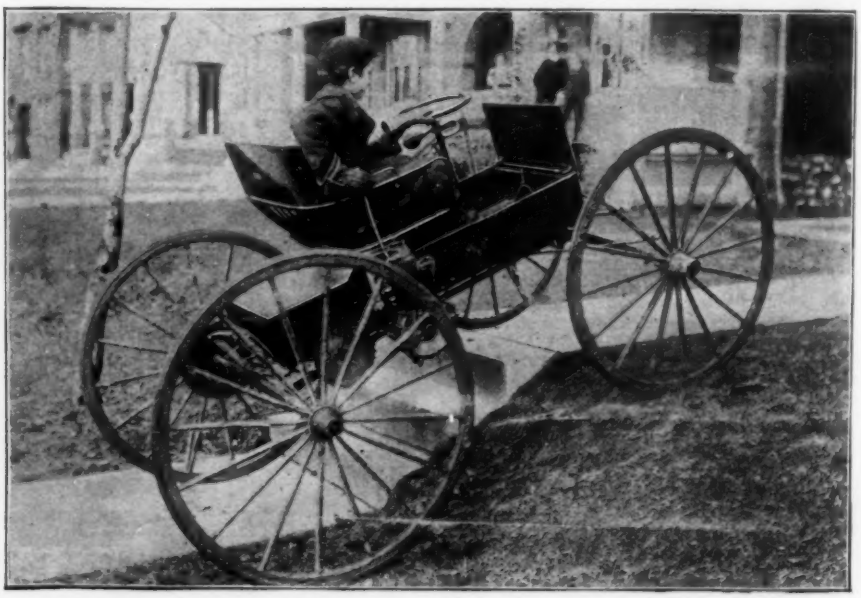
MEXICAN GOVERNMENT BUYS RAILROADS

The Mexican government, by the purchase of a majority of the stock in the most important lines of railroad in that country, has secured complete control of 7,190 miles out of a total of 10,900 miles now built. The unpurchased lines consist of numerous companies with widely separated properties and will also doubtless be absorbed some day. The government ownership consists in owning a majority of stock in a holding company, which in turn owns a majority of stock in the several operating railroad companies.

THE COMING OF THE CHEAP MOTOR RUNABOUT

The inexpensive, though practical, low-priced motor vehicle, not capable of dangerously high speeds nor embellished with all kinds of accoutrements, costing the buyer about $250, is bound to come. It will be so simple the owner will not need a professional motor engineer to run it, neither will he require a fat bank account to keep it in repair. It will correspond to the average one-horse buggy seating two passengers, and costing for horse, harness and vehicle $250. The popular two-passenger motor car will soon be available at this price—$250, and the builders will sell them by the hundreds of thousands just as the horse-drawn vehicles are now made and sold by the hundreds of thousands each year.

In fact, the advance guards of the low-priced motor buggy are already here, and several firms are making specially for rural letter carriers motor vehicles which sell from $225 up to $400. And the rural carriers with 25 to 30 miles



Runabout Built for Rural Letter Carriers

to travel over country roads each day are finding out how good they are, that the cost of repairs and supplies is about one-half the cost of horse-keep and that they can serve their routes in one-third the time, thus improving the service greatly.

The demand for cars costing thousands of dollars and in each of which the manufacturers' profit is as large as on 20 cheap vehicles, explains why the cheaper vehicle has been ignored. Their shops can contain only so many "jobs" at a time and for those manufacturers the smaller outfits would not pay.

The time will soon come, however, when the cheap vehicles will be built in all parts of the country on a scale small compared to the factories of the big makers. It will be like the making of bicycles, which at its height was most successfully done, not by factories in which all the parts were made, but in shops where all the parts were bought in large quantities from specialty makers, and the manufacturing was really only the assembling of parts and painting.

So it will be with the runabouts. Already any one clever with tools can purchase every part required to construct a very respectable and serviceable motor vehicle, which he can himself put together. Where the putting together is done in large quantities on a system of time-saving labor, a very fair vehicle can even now be sold for $250, with a good profit to the builder.

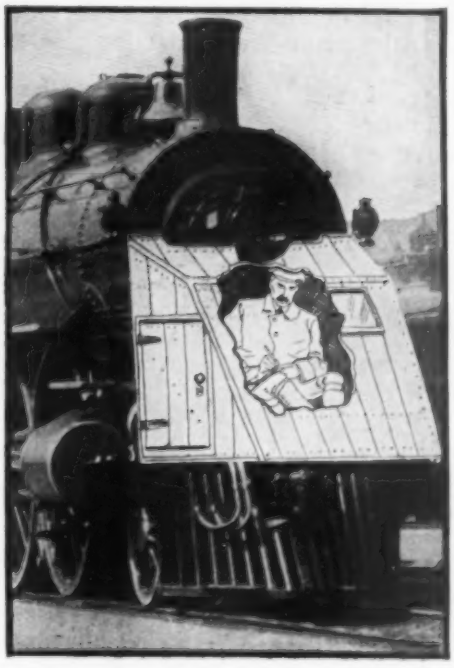
Government statisticians state that last year there were built in this country horse-drawn vehicles of all kinds a total of 1,700,000; and that of this astounding number two-thirds, or over 1,000,000 were pleasure vehicles, and of these fully 800,000 were two-passenger vehicles. Nor is the output mentioned anything phenomenal; it shows about the same gain over the previous year that has characterized the business for years past.

Is it not evident that the great numerical field for motor vehicles is not in the cars costing thousands of dollars each, any more than the bulk of the carriage business is in outfits costing $2,000 apiece? The motor vehicle will not have its day like the bicycle, although our readers would hardly believe the figures of bicycles made and sold last year. They are now being used for purposes of utility, not pleasure, and with improved pavements in cities and better country highways the time is almost here when more bicycles will be in use than ever before.

There has ceased to be the pleasure in riding a bicycle there once was, but the motor car, requiring no exertion, will always be desirable for both pleasure and utility. And when the $250 motor can be had in plenty then and not until then will the horse really begin to disappear.

Five hundred thousand—half a million—motor runabouts at $250 could be sold this year of 1907 if they were ready for delivery. By another year they will be made by thousands, and no other manufacturing business today offers such opportunities for making big fortunes as this.

PERILOUS WORK OF THE SPEED TESTER



It is one thing to take the readings of a stationary engine in a nice warm power house, but quite another to make the record of a big freight locomotive. These readings are made to secure data from which are determined the conditions under which the locomotive does its best work. When a new engine comes out of the works its record of power produced with certain amounts of fuel is taken. At intervals thereafter other similar records are obtained, and to do so the operator must ride on the pilot, a perilous and uncomfortable position.

Even in summer when exposure to the weather is much less, it requires a good deal of nerve and a cool head to do the work. The speed tester frequently is obliged to lie flat, stretched at full length across the pilot, which

does not ride with the gentle motion of a Pullman. In winter a man would freeze to death in this position and a small wooden coop is built with doors at each end through which he can watch and adjust the instruments with which the "card" or record is made.

The danger of the work was brought to public attention last month in a collision on the Baltimore & Ohio railroad, in which C. T. Runnels, a speed tester was instantly killed, his body being fearfully mangled. Although he could see the approaching smash he was caged in such a manner that it was impossible to escape.

BATTLESHIP "VERMONT'S" HARD TEST

In a 50-Mile, 12° Below Zero Gale, She Exceeds Requirements

When the battleship "Vermont" steamed into Boston harbor last December she looked more like a floating ice palace than a man-of-war, having endured a trial run probably the most severe ever given any fighting ship.

The course was off the coast of Maine, and the first test, a 4-hour speed run, was made under 300 lb. steam pressure, with a record ranging from 18.25 knots up to 18.58 knots, and averaging 18.33 knots per hour. Following this was the 24-hour endurance run with an average record of 17.50 knots, but during this test a 40 to 50-mile gale was blowing with the thermometer at 12 degrees below zero. The waves that dashed over her quickly froze, until tons upon tons of ice covered the decks and turrets. Not an inch of deck or superstructure but was encased in ice.

The keel of the "Vermont" was laid on May 17, 1904, says the American Marine Engineer; her dimensions are: Length, 450 ft.; breadth, 76 ft. 10 in.; displacement, 16,000 tons; draft, 26 ft. 9 in.; horsepower, 16,500. She was launched September 1, 1905, and tested December 2, 1906. The vessel is designed as a flagship, with ample quarters for fleet officers, ship officers, and 761 men.

STEEL TIES FEARED

The steel tie has received a set-back as the result of the accident to the Pennsylvania flyer which went into the river near Johnstown. At the point where the disaster occurred the track was laid on steel ties, and while at first, officials of the company denied the ties could have caused the wreck, it is significant that a week later orders were issued for the immediate removal of every steel tie in the company's tracks.

Pig iron and diamonds are true barometers of trade. When iron is high, so are diamonds; although one is a necessity and the other a luxury.

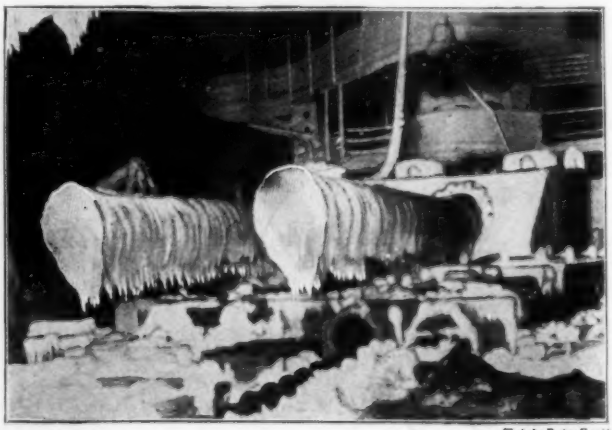
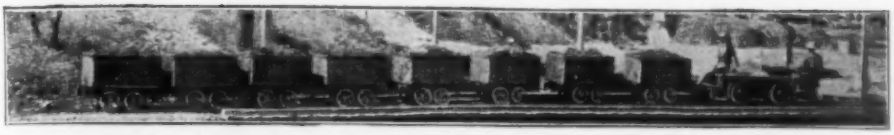


Photo by Boston Herald

The Ice-King's Leviathan

A Corliss engine can be made to do more work by raising the boiler pressure, increasing the speed, or giving less lap to the steam valves.



ELECTRIC MINE LOCOMOTIVES

Strenuous Work of Smokeless Engines Thousands of Feet Underground

Hundreds and even thousands of feet underground, in the coal, iron and copper mines of the country, electric trolley cars are running night and day, of which the public never hears. On these subterranean railroads the cars move on as exact time schedules as the surface cars, but the motorman is never laid off for failing to shine his brass buttons, and there is no sign forbidding him to talk to passengers. Through avenues of darkness the trolley of the mines finds its way, the passing of the electric headlight leaving the caverns blacker than before. In the most remote room of the farthest drift the lonely miner anxiously looks forward to the hour and minute when the electric locomotive is due, for it means release from work, and swift conveyance to the living world again. The motor is as surely driving the mule from his underground prison, as it has from the street car. The first electric mine locomotive in this country went into service in the Lykens Valley Colliery of the Pennsylvania railroad in 1887, and while many improvements have come since then, the original "Pioneer" is today still making its regular trips.

The introduction of hundreds of mine trolley cars was not founded on any sympathy for the unhappy mule, but strictly as a business proposition. The trolley is cheaper. Unless mine cars of unusual size are desired, the same light rail can be used for a trolley system, and the track and overhead wiring installed at a cost of only $200 per 1,000 ft. To this add cost of a generator of suitable size and about $2,500 for each locomotive.

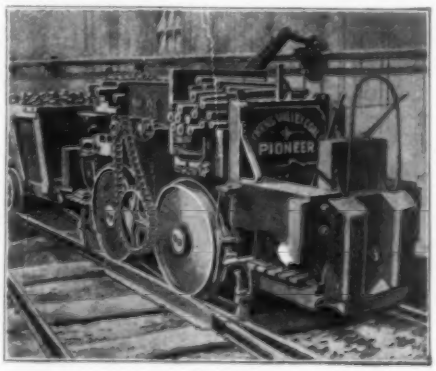
As an illustration the following figures taken from a small mine using only one locomotive will show the saving. The entire cost of locomotive and all other machinery and wiring was $7,625; and the cost of hauling 288 tons of coal per day, is $7.96 or 2.76 cents per ton, for the following:

Station engineer	$1.75
Motorman	1.75
Helper	1.60
Repairs	.76
Depreciation	1.90
Oil and waste	.20
Total	$7.96

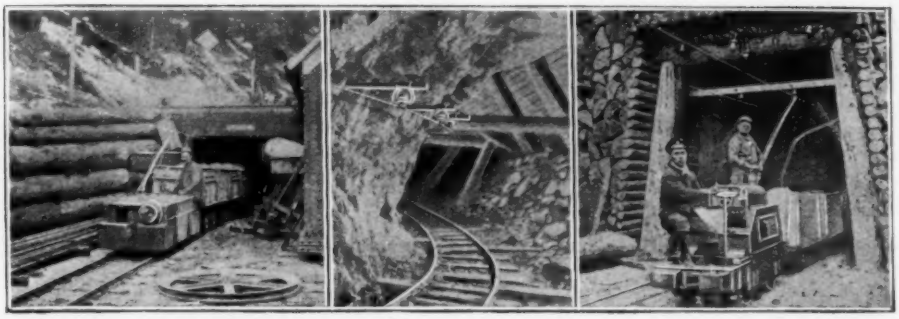
To haul this coal by mules would require:

Seventeen mules at 50c each	$ 8.50
Three drivers at $1.45 each	4.35
Three drivers at $1.25 each	3.75
Four boys at $1 each	4.00
Total	$20.60

or 7.15 cents per ton; a saving by electric haulage of 4.39 cents per ton. The saving per year at this mine is $2,528 or $12.64 for each of the 200 working days. A mine system of electric haulage pays for itself in from one to four years out of the saving in cost of opera-



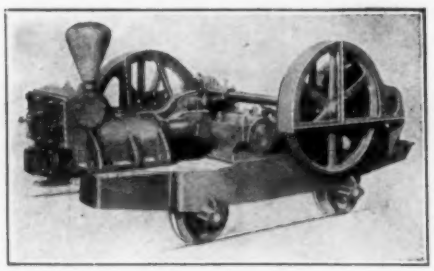
The First One



Kellogg, Idaho Hancock, Mich. Ashio, Japan

tion; in fact one mine has a big electric locomotive which cost $4,500 and saves the company $6,000 each year. Some of these lines are very far underground, one copper mine in Northern Michigan is operating an electric railway 4,400 ft. below the surface. The overhead trolley system is considered best for underground work and is the method generally employed, the wire being suspended on small brackets along one side of the tunnel. The trolley pole is short and made of wood, while the trolley wheel is of the usual type. The locomotives run in either direction by manipulating a small lever, and some of them weigh as much as 13 tons. The steeper the grades in a mine the heavier and more powerful must be the locomotive.

These mine engines possess an advantage not enjoyed by any street car, for they can go several hundred feet beyond the end of the trolley wire. This permits runs to newly opened parts of the mine without the necessity of extending the overhead wires each day, and is accomplished by means of a cable reel carried on the car which automatically makes connection with the end of the feeder wire and unwinds as the car proceeds, supplying current to the motor. On the return trip the cable is picked up and rewound on the reel. All this is accomplished without any attention whatever from the motorman.



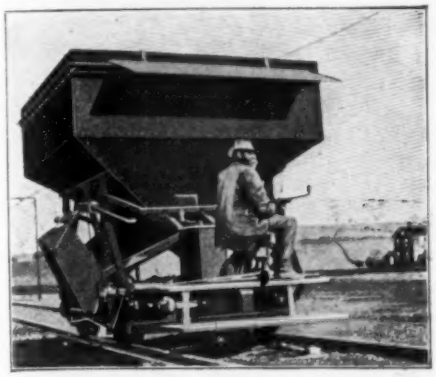
Electric Mine Pump

Another interesting machine is the electric pump car. This consists of a very powerful pump driven by a motor taking power from the trolley wire. The outfit is mounted on wheels and can be hurried to any part of the mine and is ready to go to work the moment its destination is reached. It is used both in extinguishing fires and in keeping down the water until a permanent pump can be installed. It throws a stream of the same size and force as an ordinary steam fire engine.

Locomotives used in pick-up work, hauling cars from the chambers out on to main lines where trains are made up weigh from 4 to 6 tons. One motor will serve 20 or more chambers taking out the loaded cars and switching in the empties, amounting to about 250 cars per shift. The locomotives are so compact they can work where mules cannot stand upright.

Above ground the mine locomotive finds plenty to do in hauling materials about the yard, switching, and other work which would require many horses or mules. Coke ovens are now generally served by electric motor cars with immense steel hoppers, called larries. The electric larry weighs 3 tons

and carries 6 tons of coal. It runs on an all-steel track along the top of the burning ovens where it is extremely difficult to work animals on account of the heat, flames and gas. The electric larry shies at none of these and accommodatingly dumps its load into the red hot opening on whichever side of the track the operator wills.



6-Ton Electric Larry

It was a great day for mules and managers when the first electric mine locomotive went into business.

WHY "MADE IN GERMANY" BEATS "MADE IN U. S."

We Americans are convinced we can do most things better, and certainly much quicker than anybody else. And in very many cases this is literally true; in other instances it is true only in so far as the doing is for home consumption. We look out on the increasing markets of the world and it seems impossible that foreigners could prefer any make of anything to that stamped with a triumphant Eagle. But this thinking does not cinch the export trade, and what American manufacturers don't know about the very first elements of exporting would fill large books.

We have demonstrated what is best for us, and therefore we should be the judge of what is best for those buyers abroad to whom we would sell. In so doing we forget that people are much alike the world over after all, and that one of the things a Yankee most resents is having anybody else assume to tell him what he wants!

In commenting on the import into Brazil of pianos and musical instruments, Kuhlow's German Trade Review (Berlin), speaks of the wealth and musical culture of Brazilians and adds these significant words:

It is one of the very best fields for activity in all the Latin countries, yet U. S. A. exports of musical instruments to it are so small as to be hardly worthy of the name.

The three great exporting nations of the world in manufactured articles of all kinds are Germany, England and the United States. Yet Germany, possessing neither the wealth nor the population of either England or the United States, surpasses its two rivals in the profitable, complete and thorough way in which they obtain the control in every country where they seek to make the German goods known.

It is not altogether a question of price; and making the piano as cheap as the German will and landing it at Rio de Janeiro, or any of the other ports in Brazil, will not capture the trade. The Brazilian has wishes, prejudices and tastes which must be catered to. The German does it. Neither the English nor the Americans try. Hence the German gets the trade, and everybody talks about the American invasion of this, that and the other country, but does little or nothing.

A bit of history will illustrate the point. John Stephenson was the first and for some years the only builder of street cars. One day a manager came to his factory in New York, and ordered some cars for a new line in Albany. Price and all details but one were agreed upon. The buyer said the cars would run out to a suburb where the people were Scotch, and to please them he wanted the outside panels of the cars painted in a plaid. Stephenson refused to paint the cars in that way, and rather than do so let the buyer go to another concern for his cars, which he did.

If the Brazilians want their pianos polished with stove blacking, and a medicine chest over the keyboard, and will not have them any other way, and are willing to pay a price profitable to the manufacturer, it is a short sighted policy which fails to fill their wants, as the wanters want them, and with goods bearing the words "made in U. S."

ELECTRIC STEAM FIREWORKS

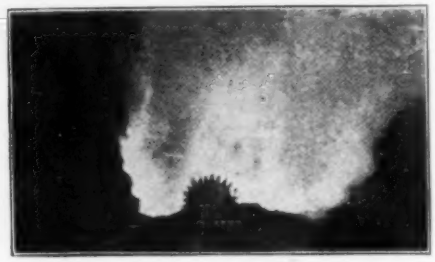
A Novelty in Outdoor Color Display

The latest thing in fireworks involves no fire at all—that is no fire that can be seen, for the most beautiful effects of color are obtained with electric lights and some clouds of steam. The current for the electric searchlights is secured from any convenient supply, and the colored screens are the same as used nightly in every theater, but the artificial clouds necessary as a background for the colored lights is interesting.

Courtesy, Western Electrician.

The Fan Effect

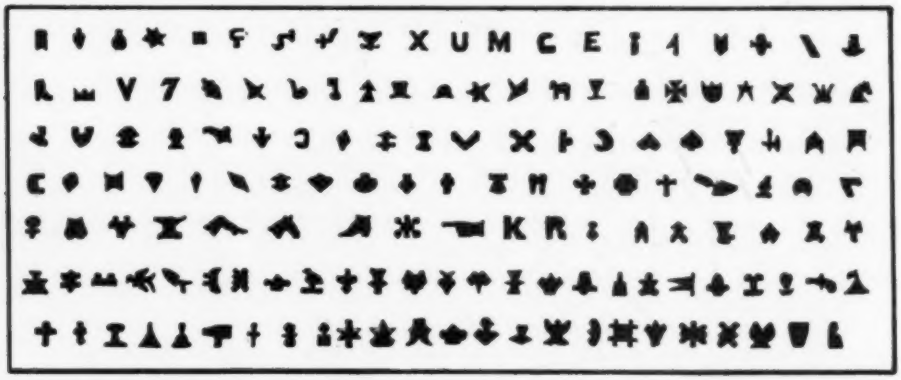
A good sized portable boiler, on wheels, furnishes the steam which must be at about 75 lb. pressure. The steam is conducted through iron pipes into frames of various shapes, made of pipes with numerous small openings. The escaping steam rises in a sheet producing a moving cloud effect, and when the colored lights are played from ten or more searchlights the result is a novel delight. Not only colored lights but portraits, landscapes, marine views and moving pictures can be thrown on the clouds of steam in combination with changing color schemes. One slide which calls out special applause is the American flag in its red, white and blue, and when this is thrown on the steam, the waving effect is perfect and it is hard to believe one is not actually looking on a silk flag 50 ft. in length.



Electric Sunburst

The flags of all nations will be displayed in this manner every night at the Jamestown Exposition.

Trout Lake, Minnesota, is to be drained at a cost of $2,000,000 because the water leaks into the Canisteo iron mines.



An infinite variety of dies are used in railroad conductors' punches. Did you ever see one of these in your ticket? One manufacturer alone has over 500 punch dies, no two alike.

PHOTOGRAPHING A VOLCANO

One of the most daring feats in photography ever undertaken is to be attempted by a Mr. James, an American, in the Hawaiian Islands. If he does not perish in the effort he will secure moving pictures of the lava when it overflows the pit of Halemauman, in the immense crater of Kilauea.

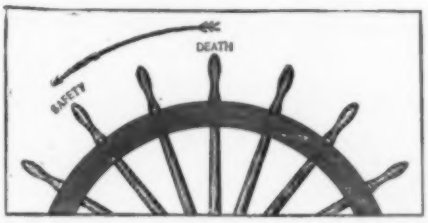
The lava is now boiling and bubbling in the pit, shooting upward in cones of 75 to 150 ft. in height. The lava in the vast cauldron has risen hundreds of feet, and it is believed will shortly overflow the sides of the pit which was 800 ft. deep about two weeks ago.

Mr. James proposes to have the picture machine near the crater when this lava slops over and show in actual motion the progress of the running, spouting molten mass. Such views would not only be thrilling and realistic, but possess great educational value.

The time is near at hand when a motion picture machine will be considered as necessary a part of the equipment of every high school, as a dictionary or maps.

The same instrument would be used in a great variety of ways, teaching in an instant and with the utmost exactness what would require pages of text. In geography, botany, geology, natural history, physics, chemistry—in fact in every branch the stereopticon will be of incalculable value. Such machines, and good ones, can now be bought for less than $100 and last practically forever. The matter of light has also been solved with a cheap, simple and effective lighting outfit.

The largest and heaviest double gate valve in the world was recently installed in a power plant at Niagara Falls. It contains over 60 tons of metal and the parts are over 9 ft. in diameter. It is large enough for a man to ride through on horseback.



THE "LARCHMONT" DISASTER

"A turn of two spokes of the wheel to port on both vessels five minutes or less before they struck, as they were evidently intending to pass each other to the right, would have allowed them to pass each other uninjured, and the 150 innocent persons sacrificed would have been alive today, as the schooner struck the steamer on her port side, the side the schooner should have passed without colliding."—Editor Marine Journal.

It's the old, old story of the tragic sequence of what appear insignificant things. A careless flagman goes back only a little way and when the unexpected train appears, signals too late, and a terrible collision occurs.

A telegraph operator omits one word in the message he is sending and the next day men loathe the name they had always honored.

A carpenter is building a dock at a summer resort, and his supply of nails of suitable size giving out, he finishes the job with the smaller ones at hand. A month later a merry throng crowd the platform and some are drowned as the structure goes down.

An electrician slights a job of wiring —it's concealed, no one will know it— but one day the cry of "fire" is heard in a vast audience and scores are crushed in the panic or burned in the flames.

A clerk is filling a simple, harmless prescription, and absent-mindedly takes down the wrong bottle. His remorse is sincere but it cannot restore life to the dead.

An operator touches the wrong lever; the power of mighty engines instantly responds; and a great cauldron pours out tons of liquid metal upon the helpless men below.

This is not a sermon. It is the

lesson of awful consequences which may follow the failure to rightly do the things which, by reason of their often doing, seem commonplace and insignificant.

GREAT TRESTLE BRIDGE ON VANCOUVER ISLAND

A massive wooden trestle which carries the track of the Esquimalt and

195 Ft. High

Nanaimo railway over the Niagara Canyon in Vancouver Island, B. C., is 585 ft. long, and the rails are 195 ft. above the water. The trestle, which contains about three-quarters of a million feet of timber says Railway and Locomotive Engineering, was built when timber was cheaper and steel bridges not so much in use. The wooden bridge and the wooden trestle are purely American products, although invented by Leonardo da Vinci in the sixteenth century.

TRAIN WRECKS GRAIN ELEVATOR

One of the strangest accidents that ever befell a grain elevator happened at German Valley, Ill., when a 50-mile passenger train on the Great Western plunged through the building. In the wreck the elevator was demolished, four passengers were killed and many others nearly smothered under the thousands of bushels of grain that poured down. The engine missed the building but the mail car went through the elevator and the other cars piled up around it.

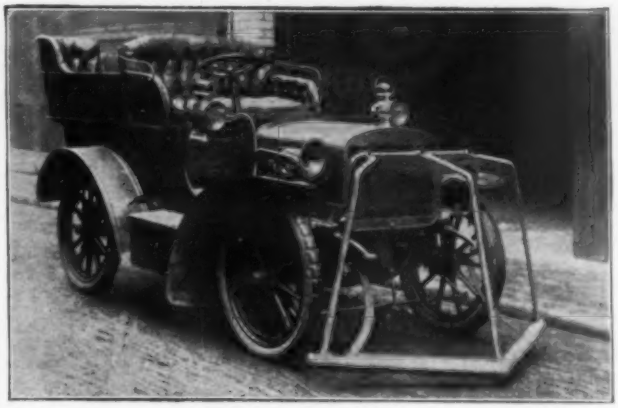
Courtesy Grain Dealers' Journal

A Peculiar Accident

In England the telephone apprentice serves three years. In the shop, 6 months; with experienced instrument setter, 3 months; in switchroom, 18 months; testroom, 3 months; and on instrument faults, 6 months.

An alloy of two metals often melts at a lower temperature than either of the metals it contains.

ENGLISH AUTOMOBILE LIFE GUARD



English Auto Car Guard

The life guard shown in the illustration attracted a good deal of attention in London last month as a possible remedy of the many fatalities which attend the reckless operation of motor cars. There has been some newspaper talk in England indicating there may be a law passed requiring a life guard on every motor car. The guard or "cowcatcher" shown looks much less unsightly than one would expect of such a contrivance, judging by the monstrosities which most street cars in American cities carry in front.

That the protection of pedestrians from being run over may become compulsory even in the United States is by no means unlikely, for during the past winter bills were introduced in more than one legislature, though we believe none became a law. Owners of motor cars would dislike for many reasons to be obliged to carry a guard although it would not look queer as soon as generally used.

RECESSION OF NIAGARA FALLS

Greater on Canadian Side

In a pamphlet by G. K. Gilbert of the U. S. Geological Survey, much interesting information is given on the recession of Niagara Falls. On account of the greater volume of water passing over the Horseshoe Fall, and the consequent removal of fragments of rock at its base, the wear is very much greater than on the American side where the water is comparatively shallow.

A record of 63 years, ending 1905, shows an average recession of the Horseshoe Fall of 5 ft., while the American Fall has only averaged 3 in. per year for 78 years.

BY RAIL TO TOP OF MATTERHORN

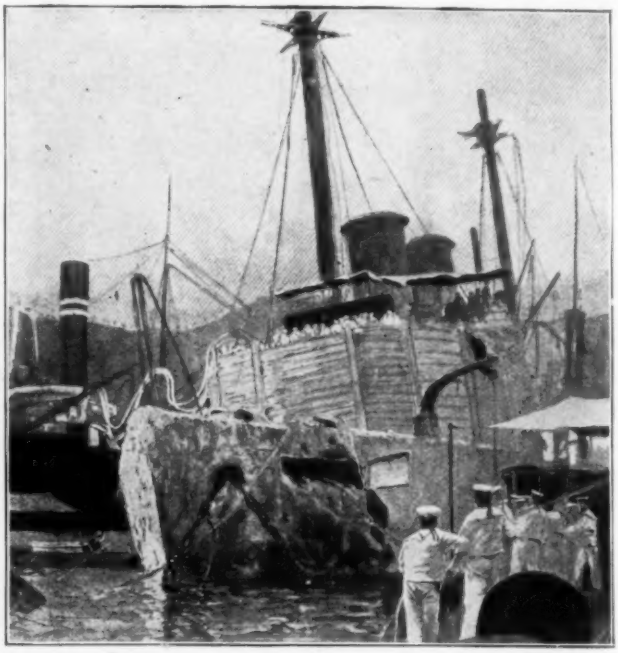
Only 40 years have passed since the first ascent, on foot, was made to the top of the Matterhorn. Within four years a cog railway will land passengers at the very summit, 14,780 ft. above the sea. There will be one almost perpendicular tunnel 7,700 ft. long, or rather high, for the grade will be 85 per cent. At the top a hotel will be excavated in the rock, with rooms looking out upon the magnificent panorama. One room will be supplied with oxygen for treatment of tourists who suffer from the altitude. The ascent will take 90 minutes; fare for round trip $10. The trip is now made on foot in 24 hours, up and back; cost of guides $40.

Pat acknowledged himself puzzled. "They call it an indecent electric light," said he, "but it do beat me how they make the hairpin burn in the bottle."

JAPS RAISE THE "MIKASA"

Togo's flagship, the "Mikasa," has been raised after lying for nearly a year at the bottom of the harbor of Sasebo. It will be remembered the battleship exploded in a mysterious manner and sunk in a few moments while at anchor. The cause of the disaster is now known to have been spontaneous combustion due to the decomposition of chemicals. The Japs never consider a vessel lost simply because she has gone down. All the Russian ships which were sunk at Port Arthur have been raised and are now afloat and in service of the Japanese navy. Japan has recently launched her thirty-third destroyer built since the war, has recovered two of her own battleships and is building seven more heavy fighting ships.

A land to land voyage of three and one-half days is planned for a steamer line from Halifax to Black Sod, Ireland.



The "Mikasa" as It Appeared When First Brought Into Dock After One Year on the Bottom

PROPER CARE OF AUTOMOBILE SPRINGS

The springs of an automobile should be well looked after and when the car is not in use, jacks should be placed under the frame, in order to take the weight of the car off the springs and tires, says Automobile Topics. This serves a double purpose, inasmuch that the springs are allowed to retain their proper shape, and the tires will last longer if the strain is removed when not in use. When the weight of the car is taken off the springs, it will be found an easy matter to insert the point of a screw-driver, or any similar tool, between the spring-plates, forcing them apart sufficiently to inject grease or any lubricant, between the leaves. This will remove all possibility of the springs squeaking when riding over uneven surfaces, and will always improve the riding comfort of the car.

SNAKE-BITE LANCET

An inexpensive instrument called the "snake-bite lancet," the invention of Sir Lander Brunton, has been introduced in India with splendid results. It is being distributed by the government in an effort to reduce the fearful loss of life which amounts to 75,000 persons each year.

A report by one person is to the effect that he had saved the lives of 20 persons bitten by cobras and karaits within the last year by the use of one lancet.

SUICIDE STOPS WATER SUPPLY

One man in his successful effort to kill himself threw 400 men out of employment for three days and caused the closing down of a large industry. The plant, which is built on the shore of Lake Michigan, in Chicago, requires immense quantities of water, which is pumped from the lake through an 18-in. main. The man was seen to jump into the water near the intake, but could not be rescued. A few minutes later the water supply failed and the works were shut down.

Owing to the great blocks of ice which a storm was driving upon the shore it was impossible for divers to go down for three days, when the body was found tightly jammed in an elbow of the big pipe.

CONCRETE PRESSURE PIPES

Pipes made of reinforced concrete for transmitting water under pressure have been constructed. These pipes are really one continuous tube, each several hundred feet long. In diameter they are from 2 ft. to 3 ft., the longest single section being 600 ft. The inside is made quite smooth, planed lumber being used in the forms.

CART BEFORE THE HORSE

The very latest Paris novelty in the vehicle line is a four-wheeled surrey in which the cart is actually before the horse. Another feature which attracts attention is the driver, who is a woman.

A 1907 Model

This 1-hp. motor starts and stops on command, and has two speeds forward; the machine is not constructed to reverse. No lines are used, the conveyance being directed by means of a steering wheel. The outfit has not yet been arrested for fast driving.

EGG-BLOWING ON ICE

A new game which has been quite a fad in Europe the past winter is egg-blowing on ice. The Illustrated London News says:

Good for the Lungs

Every woman player has a man for partner. Parallel tracks are marked out for each pair and all start level, the ladies, on skates, forming a line at one end of the course, the men, wearing shoes or boots, at the other. Partners face partners. First the ladies skate forward, blowing the eggs along with fans. As soon as they reach the other end, the men fall flat and wriggle along, blowing the egg back again. The partners whose egg gets back first are the winners. The sport is immense and even the gravest dignitaries have been known to bend to its charms.

TO BUILD AUTO TOLL ROAD

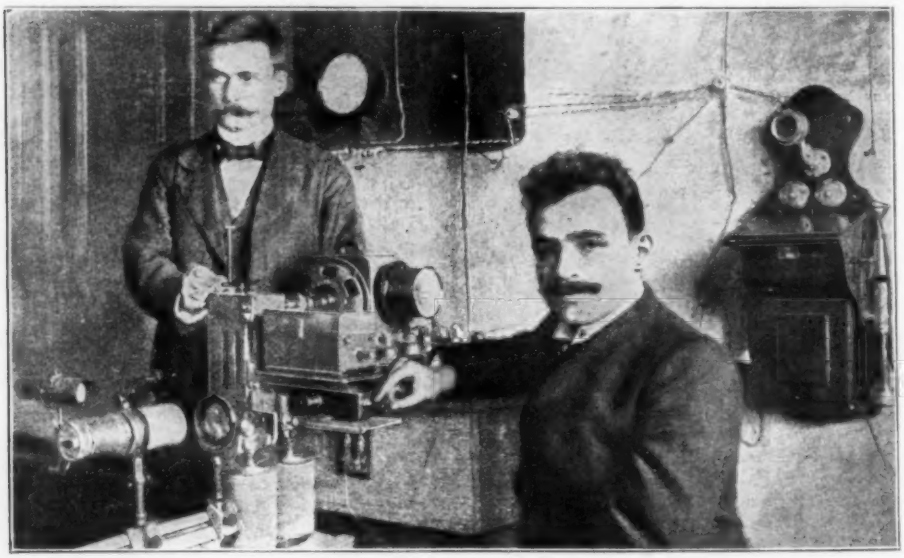
To promote a toll road would seem like going back to early days, but a $10,000,000 company has already begun construction on a 45-mile auto toll highway in New Jersey. There are to be two 35-ft. tracks, divided by a 30-ft. roadway elevated 4 ft., to be occupied by a double track railroad for motor drawn trains.

PHOTOGRAPHS TELEGRAPHED 1,000 MILES

Great Improvements Make Transmission a Practical Success

[Extract from translation, and photographs shown, are reproduced from copyrighted article in L'Illustration, Paris, by special permission]

Professor Korn, of the Munich University, has so perfected his previous apparatus for telegraphing photographs that he pronounces the transmission a practical success. His former accomplishments were remarkable, but the pictures were far from satisfactory. He has now wired portraits from Munich to Nuremberg, a distance of 100 miles, and also made transmission over 1,125 miles of wire in his own laboratory, in 18 minutes. He expects with some changes to soon have apparatus which will overcome the high resistance of submarine cables and enable him to send a photograph 6 by 7 in. from London to New York in 12 minutes.



Photograph of Prof. Korn in his Laboratory, with Apparatus for Telegraphing Pictures

Reference to the diagram will make the following general description plain to our readers: The photograph which has to be transmitted is placed on a transparent glass cylinder which revolves slowly and at the same time moves from right to left. A ray of light is thrown on the cylinder by means of an electric lamp and lens, and when the ray of light reaches the interior of the cylinder it is brighter or darker according to the coloring of that particular part of the photograph over which it passes.

Inside the cylinder is some selenium, which transmits electrical current in proportion to the intensity of the light brought to bear on it. The selenium transmits current more rapidly in bright light and less rapidly as the light decreases. The selenium is connected with the wire over which the photograph has to be transmitted.

The receiving apparatus consists of

Photograph of Crown Prince of Germany, Transmitted 1,000 Miles: Large Picture is Reproduction of Small Original in Lower Corner

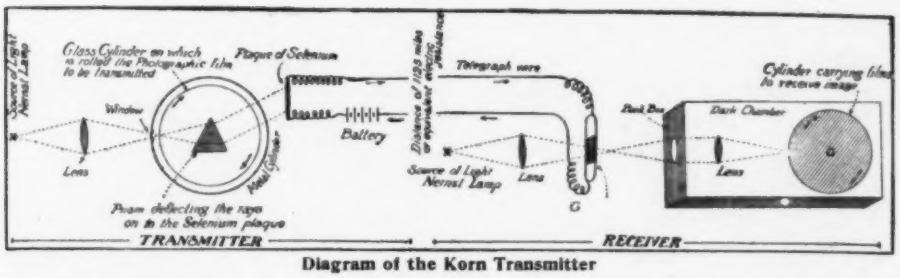


Diagram of the Korn Transmitter

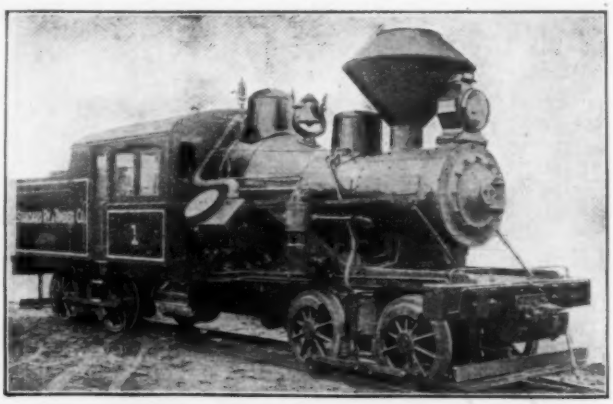
an electrical Nernst lamp placed inside a glass cylinder covered with sensitized paper. The lamp burns more or less brightly according to the varying current transmitted through the selenium at the other end of the wire. It thus reproduces the exact shade of the original photograph, provided that the cylinders at each end of the wire revolve at exactly the same speed. The revolution of the cylinders is regulated so that speed is identical at both ends.

Professor Korn was born in 1870 at Breslau and studied at Leipsic, Berlin and Paris. For 11 years past he has been professor in Munich. His first public announcement of the transmitting apparatus was made three years ago, at which time the pictures were blurred and uncertain. He has worked constantly ever since and his pictures now are clear and accurate.

A GEARED LOCOMOTIVE

Where ordinary locomotives are not suitable for hauling timber, ore cars, or for other similar service on steep grades, uneven track and sharp curves, the geared locomotive is often used.

Unlike most locomotives, the engine is located near the center and operates a longitudinal shaft, provided with universal joints similar to those in an automobile. The power is transmitted to the first and last pair of wheels by 2 to 1 bevel gears driven by the longitudinal shaft, the second and third pair of wheels receiving power by means of connecting rods as shown in the illustration. The engine is of the opposed type and revolves twice to every revolution of the drivers. This gives it great tractive force, and as the entire weight of the locomotive rests on the drivers, slipping is reduced to a minimum. It is said that the tractive force of the locomotive shown in the illustration and which weighs 52 tons is double that of an ordinary locomotive of the same weight.



Powerful but Ugly

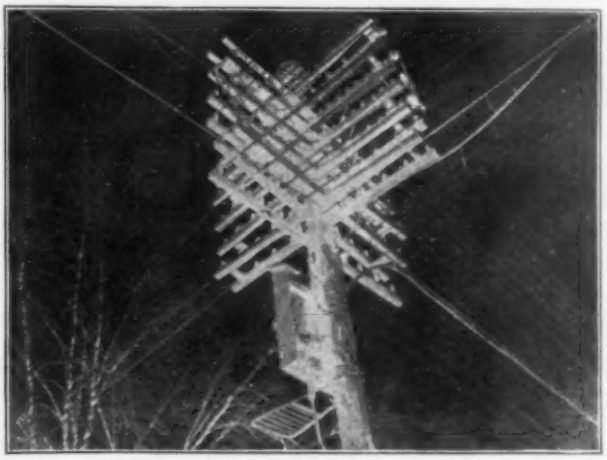
A new food prepared from kelp, a long, slimy, tubular sea plant, has been placed on the market. The preparation is made into confections, jams, preserves, marmalades, sweet and sour pickles and citron. The food is called seatron.

PHOTOGRAPHING WITHOUT PLATES

A short time ago I was entirely out of photographic plates and wishing to get some pictures of some snow scenes I thought of putting regular artificial light printing paper in the place of the regular plate. Well, it certainly worked fine. I enclose a negative; also a proof made from it. This is not, of course, a beautiful picture by any means. My reason for taking this is because I did some wiring at this box this summer and hence especially interested.

By experimenting with the paper I found that if the back of the paper were covered with a small amount of lard or oil and this allowed to soak in just before printing that it would render the paper almost transparent and a print could be made by this process in about one-third of the time the other would take. After the oil, or whatever is used, has soaked in pretty thoroughly a soft cloth or blotter must be used to wipe off all surplus oil. Great care must be taken so as not to allow any of the oil to come on the face of the negative, because when this is placed for printing the oil or lard will get on the printing paper and will keep it from toning, the same as in handling the paper with the hands if they are moist.

The best exposure is a minute and ten seconds with a wide open top. The paper may be of any standard grade of lamplight printing paper. You will probably notice the brownish tint on the one I am sending; this is due to the developer being old. I have some better ones, but they are pasted in a book. The advantage over plates is this: They can be loaded in the plate holder in daylight; that is, not too bright, but should be loaded under a yellow or subdued light. Then they may also be developed in the same light. In printing the picture the film side of the paper should be placed against the printing paper the same as with plates. Of course, pictures of this kind are not practical except for time exposures out of doors. But this is a more convenient way of having the negatives, and, what is better, they are a whole lot cheaper.—Stewart H. Leland, Lexington, Ill.



Picture Made Without a Plate

WRECK OF WRECKING TRAIN

A wrecking train on a Michigan railroad, while running at 50 miles an hour to reach a wreck, was itself wrecked by going through a bridge, and down 40 ft. into a river 20 ft. deep. The car containing the crew of 11 men, who were asleep, landed on top of other cars, and the occupants all escaped drowning by climbing out through the end of the car. Strange to say, none of them was seriously injured. Six cars, including the 75-ton hoisting crane went down, but the locomotive, which was pushing the train, did not, being derailed and hanging partly over the break.

FOOTBALL ON ROLLER SKATES

A new English sport is football on roller skates. The Illustrated London News says: Football on roller skates was inaugurated recently for men at Brighton skating rink, and the pastime was very soon taken up by women. The game is played six a side; there are three forwards, two backs, and a goalkeeper. The goals are 6 ft. high and 7 wide, and the regulation football is used, with a little over a pint of water in it to keep the ball from rising. Twelve feet in front of each goal is drawn the penalty line. Down each side run the boundaries. When the ball gets into touch it is not thrown in, but is placed on the boundary line, and pushed into play with the side of the foot. Hustling is allowed, but not charging. Outside his own penalty area the goalkeeper must not handle the ball. Two minutes is allowed to repair skates.

The game is fast and furious and creates great excitement.

FREIGHTER "COLE" LARGEST LAKE SHIP

The largest fresh water vessel in the world this month is the "Thomas F. Cole," launched at Detroit. It secures the title by being five inches longer than 605 ft. which is the length of each of two other lake freighters which will go into service at the same time this season. When seen at a distance none but experts can distinguish the extra five inches that make the vessel rank first in size.

"Hustling is Allowed, But Not Charging"

FIRST AMERICAN WINTER BALLOON FLIGHT

The first winter balloon flight undertaken in this country was made at Pittsfield, Mass., January 25, by Leo Stevens and Capt. Lovelace. The ascent was made at 3:10 p. m. with temperature reading 14° above zero. At 3,500 ft. the instruments recorded 25° below zero, and fearing death from freezing a descent was made, landing two miles from the starting point.

PUMPING WATER FROM COAL MINES

The cost of anthracite is always more or less affected by the 500,000,000 gal. of water that is pumped out of the Pennsylvania mines every day. The 1,000 powerful engines deliver from mine bottom to surface 500,000 gal. of water a minute. In 1905 the average pumped out per day was 633,000,000 gal.

TROLLEY SLEEPING CARS

Trolley sleeping cars are now in regular service on interurban lines in Illinois connecting two large cities 150 miles apart. The cars differ from the conventional sleeper in having revolving chairs instead of cross seats, which make the lower berth, and in wooden roller curtains which come up out of the floor to form partitions, with 18 in. between the berth and the partition in which to dress. Each partition has a cloth curtain-door. There is nothing unusual about the upper berths; passengers clamor for them just about the same as on steam lines. The cars are 56 ft. long and weigh 50 tons each, accommodating only 20 passengers. The service is already in considerable demand.

Trolley Sleeping Car

EXHIBITION BY FRENCH FIREMEN

At the international gathering of firemen at Milan the rope climbing ac-

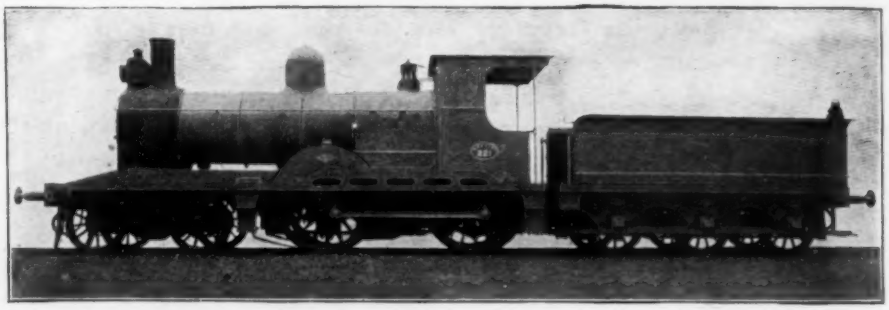
Rope Climbing Test

complishments of the French attracted much attention. A lofty wooden structure was erected to represent a tall building, and up the side of this the Paris firemen climbed on ropes with great rapidity and daring.

WINS WATER WALKING BET

Captain Oldrive won in his novel undertaking of walking on the water from Cincinnati to New Orleans, a distance of 1,600 miles, in 45 days. The prize was $5,000, and he had 45 minutes to spare. His wife accompanied him all the way in a rowboat. He used shoes made of cedar 4 ft. 5 in. long, 5 in. wide and 7 in. deep, fitted with hinged webs like a duck's foot.

The effective range of torpedoes is increasing, and is now from 3,500 to 4,000 yd.

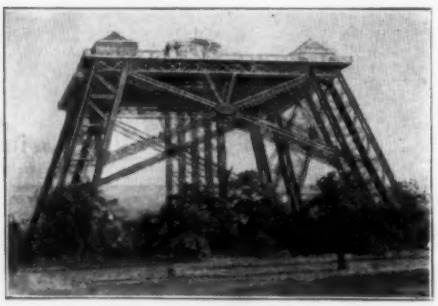


NOTABLE FOREIGN LOCOMOTIVES.—Express passenger locomotive of the Bombay, Baroda & Central India Railway. These engines are driven by Europeans, each driver having two natives as firemen. The gauge of the railway is 5 ft. 6 in.

A SECOND TOWER OF BABEL

When the Eiffel tower was completed in 1889 there arose in England a popular demand to go the French one better, and it was decided to build a tower which should make Mr. Eiffel's tower look like a pigmy in comparison. Money was raised, a company formed, and the work begun on a grand scale. The English tower was to be 1,200 ft. high, and at various levels was to contain museums, theatres, restaurants and many other places of amusement.

The location selected was Wumbley and four years was allowed for its completion. When the vast structure reached the first landing, 150 ft. above the ground, all of a sudden public interest ceased, and no more money could be secured to continue the work. For 16 years the massive framework has stood as a monument of excited folly, and now it is being wrecked for what salvage there may be in the steel.



An English Folly

MILLIONS OF HORSEPOWER IN UNITED STATES

To make the wheels go around in all the mills and factories in the United States more than 15,000,000 hp. are required every day, which is growing some when compared with a total of 2,346,000 in 1870. The increase for the five years ending 1905 was 39 per cent. In that year the division was:

Owned—	Horsepower.
Steam	10,664,560
Gas	289,514
Water	1,647,969
Electric	1,138,208
All other	91,784
Rented, miscellanies	632,905
Total in use, 1905	14,464,940

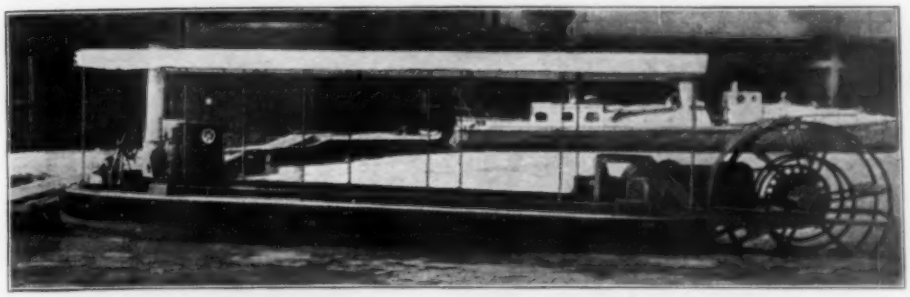
Even these figures, large as they are, must be considerably under the actual, for many power users are at remote points, where the census man seldom visits.

It is interesting to note the increase during the 10 years from 1890 to 1900 in the following powers:

Steam power increased	77.7 per cent
Gas engines increased	1,408.9 per cent
Water power increased	15.9 per cent
Electric increased	1,895.4 per cent

Steam power shows an increase of 77.7 per cent for the 10 years ending 1900, but it is a smaller gain by 31.9 per cent than for the previous 10 years. When the census of 1910 is taken the gas engine will doubtless show another big advance and steam a corresponding loss.

The gold, silver, lead, copper and zinc mines of Colorado produced $50,000,000 during 1906.



This stern-wheeler was built in England, taken apart, shipped to Terra del Fuego, and reassembled there. It is used in dredging gold.

ELECTRIC FANS FOR FURNACES

A novel application of electric fans has been made the past winter with satisfactory success in connection with hot air furnaces in residences. One section of the cold air duct leading from outdoors is made of 17-in. pipe, and in this is placed a 16-in. electric fan. The fan is of the ordinary summer type and runs from the same supply which lights the house, the expense being about one-half cent per hour while running. Its use is only necessary, however, when heating the house early in the morning, or during very windy or extremely cold days. When the fan is in motion it forces a great supply of air into the heating chamber of the furnace, and from there through the various pipes to all the registers in the house. The cost of installation is trifling, it will last for many years, and insures plenty of fresh, hot air in any room at any time. A furnace expert says that with the fan system much smaller warm air pipes can be used and still secure abundant heat.

AIR BRAKES FOR AUTOS

Air brakes may replace the present method in general use on automobiles, the compression being secured direct from the motor cylinders without the use of any compression machinery. It is estimated that approximately one-tenth of the engine power of a car would be required to work the compressor. By the direct method this loss would be entirely eliminated.

The dimensions of brake cylinders for cars of the heavier type have been estimated as follows:

6,000 pounds	5	in. diam.	x	12	in. long
5,000 pounds	4½	in. diam.	x	12	in. long
4,000 pounds	4	in. diam.	x	12	in. long
3,000 pounds	3½	in. diam.	x	12	in. long
2,000 pounds	3	in. diam.	x	12	in. long

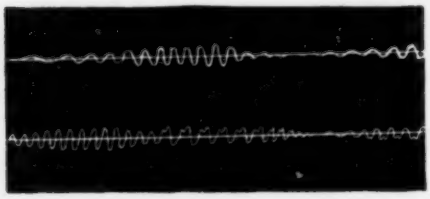
TREE STOOD WITHOUT ROOTS

In Tasmania, Australia, a large gum tree was to be cut down and the workmen sawed across the trunk two feet above the ground. When the cut was finished the tree slipped off the base, but instead of falling remained upright as shown in the illustration. It remained in this remarkable position for several days until a windstorm toppled it over. The stump will be seen at the right of the picture which is reproduced from a photograph taken by the editor of the Australian Traveler.

The Rootless Tree

PHOTOGRAPHING THE VOICE

The voice camera, by means of which speech is recorded photographically in wave-like lines, was made possible by the high-speed telegraph system described in Popular Mechanics for April, 1905. By this system writing is recorded telegraphically at the rate



Record Produced by Human Voice

of 40,000 words per hour, against the Morse instruments' 400.

In photographing the voice a microphone is substituted for the transmitter and the vibrations cause a mirror in the receiver to oscillate, while the tones are reproduced on paper in such a way as to indicate the quality of the speaker's voice: black and strong for a strong voice; small and fine for a weak voice. The instrument will be useful in testing voices and also in showing their development under cultivation.

Another adaptation of the system is its use in conjunction with a vibrator which makes vowel sounds audible to the deaf. The possibilities of the apparatus in this field are unlimited and its practical efficiency has already been demonstrated in the case of several deaf and dumb persons.

MAKING CLIMATE TO ORDER

The Colorado river was again returned to its original channel on February 11. If it stays there the Salton Sea, covering 2,800 square miles, will in a few years dry up and the inundated land be again recovered. The evaporation from the sea during the past six months has caused a startling change in climate, rain and snow falling over vast areas which for centuries have been dusty deserts. Even Death Valley has had copious rains, which if continued would soon make it inhabitable. People whose land is above high water mark want the sea perpetuated.

The interesting demonstration of a changed climate bears out the predictions of French engineers who want to cut canals and let the waters of the ocean in upon the Sahara Desert, with view to changing the climate of all northern Africa and making tillable millions of acres which are now worthless desert.

DOORYARD GOLD MINING IN SIBERIA

At the Orsk gold-fields in Siberia the peasants mine the gold in their own yards. Our illustration, from the Illustrated London News, shows them eagerly at work, though the temperature registers 20° R. below zero (—13° F.).

These prospectors are called "tributors." They may sink shafts wherever they like, provided they go down no further than water-level (usually

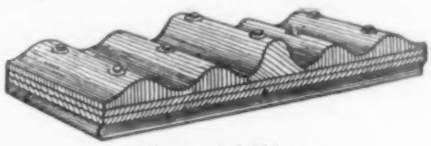
Primeval Mine Hoist

Peasants Mining Gold in Front of Their Huts

about 60 ft.), treat all quartz extracted at the mill of the ground landlord, and sell all gold extracted to him at a rate previously fixed. The rate leaves a fair profit for the peasant and a good one for the landlord. No charge is made for the use of the mill and the "tributors" frequently make fortunes.

CORRUGATED SKIN FOR PLEASURE BOATS

A patent has been granted on a novel feature in boat construction. The Motor Boat says: In boats built on the new system the skin may be in two or more thicknesses, the inner being corrugated and fitted transversely from gunwale to gunwale over the keel. This corrugated inner skin corresponds to the usual inner framing and renders it unnecessary. This inner planking is covered with a fabric saturated with a water-proof solution and on it is worked one or more diagonal skins of light veneer, according to the strength required. The outer skin is worked longitudinally in narrow strips similar to the well-known packed form of construction, the joints being filled with a water-proof solution and forced together under heavy pressure. When this is smoothed down the outer skin is practically seamless. The whole structure is fastened together with copper rivets and burrs. Where it is desired to have an especially smooth exterior finish, the outer surface is roughened and covered with an elastic



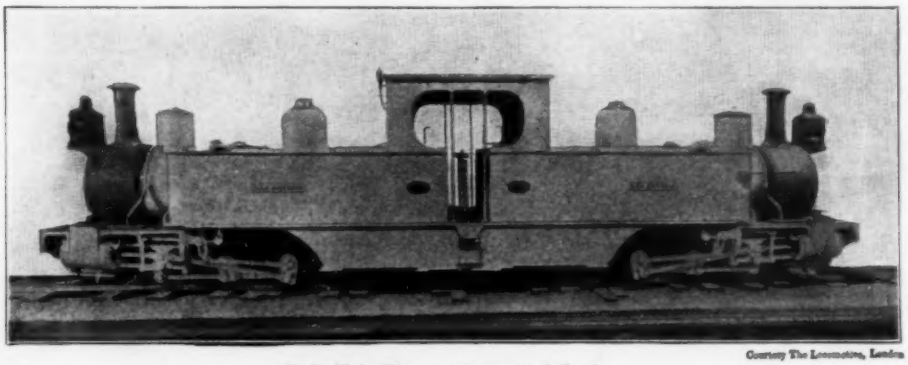
Corrugated Skin

cement. Upon this another layer of fabric is stretched and rolled into place with hot irons. Two or three coats of paint on this surface produce an absolutely smooth finish without the possibility of leak or deterioration from the weather.

Automobiles are getting to be quite handy. The latest accessory is an electric cigar lighter which is guaranteed to work in a hurricane.

QUEER LOCOMOTIVES IN BOLIVIA

The Siamese-twin effect illustrated in the picture is the result of a definite purpose, and not as might well be imagined, a freak locomotive made to pull itself apart. This type of engine, built in England for the Bolivian Railways, is so constructed on account of the terrific grades which frequently are as steep as 1 ft. in 35. Under such conditions if a single boiler of necessary length was used all the water would frequently be at one end or the other of the boiler, with disastrous results. Hence the Fairlie type, as it is known, was designed, using two boilers, each fired independently of the other. The machine is really two small complete locomotives backed together and connected permanently. The water tanks are on each side below the cab floor; the coal storage is in the side tanks above.



Courtesy The Locomotive, London

Built This Way on Account of Grades

The center line of the boilers is only 4 ft. 10½ in. above the rails; the track gauge is 2 ft. 6 in.; the drivers are 2 ft. 6 in.; cylinders, 12½ in. by 16-in. stroke; diameter of boilers, 3 ft. 5½ in.; length of boiler tubes, 9 ft. 3¾ in.; rigid wheel base, 6 ft.; total wheel base, 29 ft. 4½ in.; boiler pressure, 160 lb.; weight, 52 tons.

CHINA SHEETS INSTEAD OF WALL PAPER

The perfection of a method of manufacturing porcelain in large sheets one inch thick is announced in England. The sheets can be decorated to order in any desired design and then glazed by firing. When placed on the walls of rooms the effect is said to be beautiful, and of course the material is highly sanitary. This would obviate for all time redecorating, wall papering and spring house cleaning, and deprive the lady of the house of the two grandest events of the year.

The china is made of a mixture of ground Cornish clay and French flint boulders, and can be sold for $2.50 per square yard.

EIFFEL WIRELESS STATION

The French army has been experimenting with the Eiffel Tower as a wireless station with such excellent results the government has decided to make it a permanent station. It thus becomes the highest station in the world, although other stations are in operation at greater altitudes. Messages have been exchanged with Berlin and other cities.

A certain sign, not an advertisement, which you have all seen many times and consisting of only six words earned the man who first wrote it, $1,000 a word. Do you know what it is? If not, the May number of Popular Mechanics will tell you.

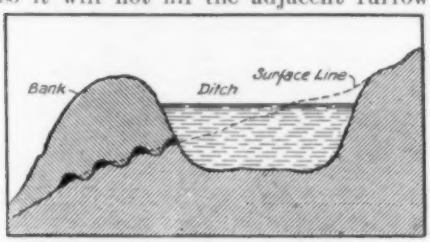
SHOP NOTES

Coloring Metals

Dissolve 4 oz. hyposulphite of soda in 1½ pt. water and then add a solution of 1 oz. acetate of lead in 1 oz. water. Place articles to be colored in the mixture and heat gradually to the boiling point. Iron is given the color of blue steel, zinc becomes bronze and copper or brass becomes, successively, yellowish, red, scarlet, deep blue, blue, light blue. By substituting sulphate of copper for the acetate of lead in preparing the solution, brass becomes first of a fine rosy tint, then green and lastly of an iridescent brown color.—Contributed by A. G. Wareham, Waterloo, Ind.

How to Make a Dike

In placing a dike or dam on the side of a hill or on a level surface it is well to prepare the surface before building by ploughing furrows on the surface to receive the bank and throwing the dirt so it will not fill the adjacent furrow

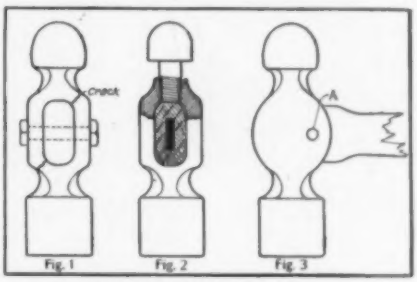


Correct Construction of Dike

but lie on top as indicated by the black portions in the accompanying sketch. This will usually prevent the water seeping through unless the earth is very porous or sandy, when it will be necessary to apply a layer of clay on the bottom and sides of the ditch.—Contributed by Geo. G. McVicker, North Bend, Neb.

Repairing Broken Hammers

In many cases hammers which have been broken can be repaired and made to give good service. When cracked diagonally, as shown at Fig. 1, the re-



Repairs for Broken Hammer

pair can easily be made by drilling for a small bolt, as indicated by the dotted lines. When the pene becomes broken, as shown in Fig. 2, a quick repair can be made by drilling and tapping to receive a steel screw, which should be ground rounded, as shown. When the head of a hammer comes off and nothing else will hold it on, the scheme shown in Fig. 3 is a good one. Drill a hole at A and drive in a steel pin.—Contributed by W. E. J., Walden, N. Y.

Safe Flash Powder

A safe flash powder which cannot be ignited either through friction or a blow consists of 10 parts magnesium and 10 parts anhydrous chrome alum. Two parts of aluminum can be substituted for the same amount of the magnesium, if desired. The powder will burn more slowly if silicic acid or powdered glass is added.—From Photographische Rundschau, Vol. 20.

A green color may be given woodwork by dissolving verdigris in vinegar and applying hot.

Heating Water by Gas

Gas heaters for heating domestic water supplies are very convenient and the cost of operating is not very large, especially when natural gas is used. The illustration, from the Metal-

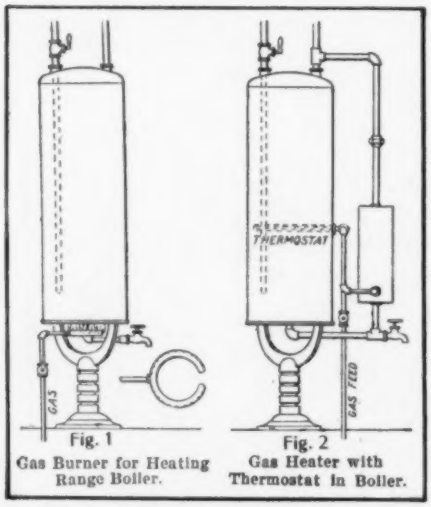


Fig. 1 Gas Burner for Heating Range Boiler.

Fig. 2 Gas Heater with Thermostat in Boiler.

Two Methods for Heating Domestic Water Supply

Worker, shows the two types commonly used. The horseshoe burner, Fig. 1, so called on account of its shape, is a simple gas burner placed about 5 in. below the bottom of the boiler.

It heats the water by burning directly up against the bottom of the boiler, but is objectionable because it will in time burn out the boiler bottom, is very slow in heating the water and is wasteful of gas. Nevertheless this burner has a considerable popularity because of the convenience with which it can be connected without interfering with the regular boiler connections.

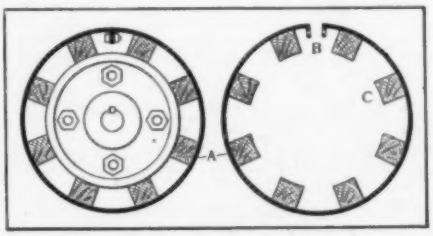
Then there is the coil, or the round cast heater, made to connect up, as shown in Fig. 2. The return pipe from the bottom of the boiler is connected to the bottom of the heater, and the circulation pipe from the top of the heater is connected to a tee in the hot water supply pipe in top of the boiler. This can be run as a non-automatic heater, or it can be made automatic by the use of a thermostat, as indicated. This thermostat, which is made expressly for this work, consists of a brass tube inside of which is a porcelain tube, arranged so that it can be set to operate at any desired temperature. This tube expands upon being heated and closes off the supply of gas to the burner. As soon as the water falls below a certain temperature this tube contracts and opens the gas valve, which allows gas to flow to the heater, where it is ignited by the pilot light.

Hiding Fine Cracks in a Wall

To hide fine cracks in a wall use plaster and whiting, mixed with glue size, says the Master Painter. Brush the mixture well into the wall so that the cracks are filled full, and when dry, smooth off lightly with sandpaper.

Coupling Converted Into Pulley

Some time ago in a shop where I was employed they had a large room filled with various machines run by a single line shaft. The countershaft of one machine was in line with a flange coupling on the main shaft and as the other machines prevented its being moved to one side, the belt was put on the coupling. The machine was driven



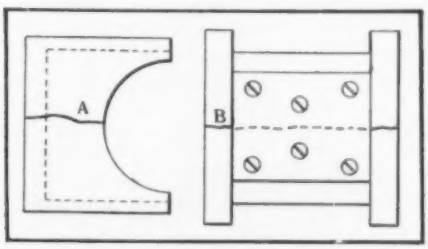
Coupling Converted Into Pulley

successfully in this way except that the speed was too low, which made it necessary to lag up the coupling as shown in the drawing. A piece of band iron, A, ¼ in. thick was bent in a circle as shown and drilled at B to allow fastening with bolts. A number of hardwood blocks, C, were screwed

to the band, the screws being countersunk flush with the band, which was then placed on the coupling and tightened up.—Contributed by Alfred S. Cromer, 466 E. Buchtell Ave., Akron, Ohio.

Repairing Brasses

An engineer recently observed that one of the brasses on the crank of his engine was cracked as shown at A. No new brasses were at hand, and as the plant operated day and night it was absolutely necessary that something be done so that the engine could be put into operation. It was finally decided that the best method of procedure was to drill three holes in each side of the crack and tap the same. A piece of steel plate was then cut out and fitted to the brasses as shown at B. Holes were drilled in this plate to line up with those already in the brass, says the Engineers' Review, but purposely drilled nearer to the center in order to bring the two parts of the brass close together. Screws were then threaded in place and headed over to prevent their working loose.

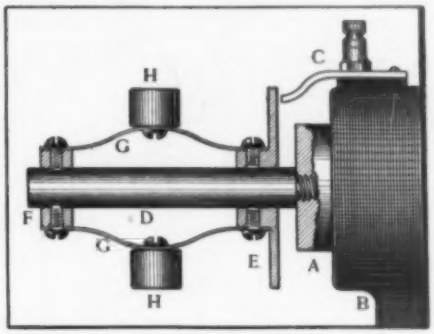


Emergency Repair for Brasses

Babbitt metal was next melted and poured into the brass, the old babbitt having been removed, a piece of shaft slightly smaller than the crank-pin being used to run the babbitt against on the inside. The babbitt was then turned out in a lathe to fit the pin. These brasses were used until new ones could be secured, and are now being kept in case of an emergency.

Electric Rotation Indicator

This device will give an alarm when the machine to which it is attached stops running. In the illustration A is the end of a shaft on the machine, B is the bearing and C is a piece of brass fastened to the bearing by means of a piece of hard rubber or other insulating material. The end of the shaft is threaded to receive a ⅜-in. steel rod, D,



Rotation Indicator Applied to End of a Shaft

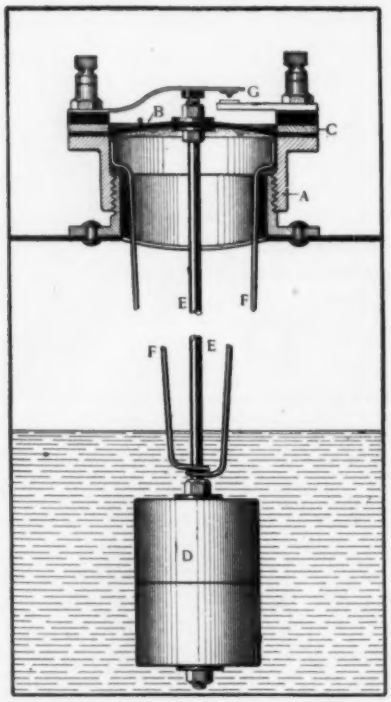
which should be run true with the shaft. The brass flange, E, is loose on the rod and the brass collar, F, is attached by means of set-screws.

The steel springs, G G, which may be made from an old clock spring, are attached to both collar and flange and support the brass weights, H H, which revolve with the shaft. The centrifugal force thus produced will draw the flange, E, away from the contact, C, while the machine is running, but as soon as it stops the springs will force the flange against the contact and ring an electric bell. One wire from the bell should be attached to the binding-post and the other should be grounded to the machine. If desired the electric bell may be replaced with small galvanometers or other indicating devices running to each machine.—Contributed by W. M. Brown, Philadelphia, Pa.

It is reported the Southern Pacific will electrify 250 miles across the desert from Reno, Nev., to Carlin. Four water power plants on the Truckee river will supply the current.

Low Fuel Alarm for Gasoline Engine

This device is applicable to either motor boats or stationary gasoline engines and is designed to give an alarm when the fuel becomes nearly exhausted. The alarm is given by means



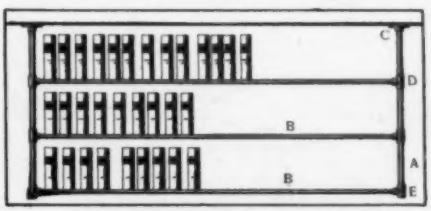
Low-Level Alarm for Gasoline Tank

of a float in the gasoline tank, which holds an electrical contact open so long as there is plenty of fuel in the tank, but allows it to close when the level becomes too low, thus ringing a bell and notifying the operator before the gasoline is entirely exhausted.

The threaded cap of the gasoline tank is removed and an internally threaded brass flange, A, is screwed in its place. The open end of the flange is then covered with a sheet rubber diaphragm, B, held to the flange by a brass ring, C, fastened on with screws. The float, D, is made of cork or other light material and is fastened to a steel rod, E, which is held in a vertical position by the guide, F, constructed of heavy wire and soldered to the flange. The rod, E, is attached to the center of the diaphragm by means of two nuts and washers, as shown, and the end is adjusted to hold open the contacts, G, thus preventing the bell ringing except when the gasoline becomes too low.—Contributed by Geo. G. McVicker, North Bend, Neb.

Hanging Shelves Made From Gas Pipe

Shelves constructed of gas pipe, as shown in the accompanying sketch, are very useful for storing away books, files and other small articles and possess many advantages over ordinary shelves and cabinets. Shelves constructed in this manner are fireproof, neat in appearance and very strong, besides utilizing considerable room without taking up any floor space. The horizontal pipes, B, may be ½ in. and the vertical pipes, A, ¾ in. These should be fastened to the ceiling either with ordinary flanges or floor fittings as shown at C, ¾ in. by ½ in. Tees are used at D and may also be used at E if it is desired to allow for adding a lower shelf in the future; otherwise ¾ in. by ½ in. ells should be substituted. If the articles to be stored are of such a nature that there is danger of their falling through the spaces be-



Suspended Shelves of Gas Pipe

tween the horizontal pipes, boards or wire netting may be fastened across the openings.—Contributed by W. H., Chicago.

When varnishing a kalsomined surface, treat it first with light gelatine size.

How to Make Soldering Paste

Soldering paste, says the Brass World, has now come into extensive use in electrical work as a flux for soldering. This has been brought about by the requirements of the electrical trade that in certain forms of soldering no acid shall be used. For soldering copper wires for electrical conductors, soldering paste is almost exclusively used. It has also entered other fields of soldering, particularly in instances where spattering and corrosion are objectionable.

Soldering paste which is now used in the electrical trades consists of a mixture of a grease and chloride of zinc. The grease which is commonly used is a petroleum residue, such as vaseline or petrolatum. Such a material is about right in consistency. The proportions which are used are as follows:

Petrolatum .....1 lb.
Saturated solution chloride of zinc .....1 oz. (fluid).

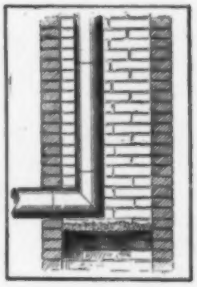
The use of petrolatum instead of vaseline is recommended. While they are identical in composition, the name "vaseline" is registered as a trademark and commands a higher price on this account. Petrolatum is much cheaper.

The chloride of zinc solution is made by dissolving as much zinc in strong muriatic acid as it will take up. An excess of zinc should be present and all the acid neutralized. This will form a thick, oily solution. The petrolatum and chloride of zinc are mixed and thoroughly incorporated by means of a mortar and pestle or by vigorous stirring.

The advantage of this soldering paste lies in the fact that it does not spatter and is not corrosive. It will be found excellent and is now extensively used.

In the transmission of compressed air a loss of from 2 to 10 per cent results from pumping the air from the engine room instead of air from a cooler place.

To Remedy Poor Draft in Large Chimney

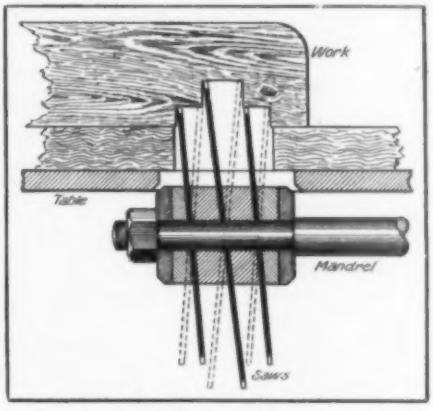


Gives Good Draft

It is an advantage to have a little too much draft in a stove or furnace, as it can always be reduced when necessary, but it is not always good to have a large chimney. A correspondent of the Metal-Worker has found that a large chimney gives a good draft with a large fire but a very poor draft with a small fire and recommends the construction shown in the sketch to overcome difficulties of this kind.

A Wabble Saw Kink

The wabble saw is an old device, but the following application is one that is not generally known. In this case the work was to be notched out, as shown in the illustration, which made



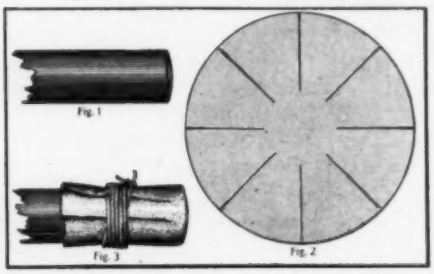
Wabble Saw Kink

it necessary to use three saws instead of one. The washers between the saws were made of babbitt metal and were beveled as shown. The bottoms of the notches were not perfectly straight but slightly curved, as is the case in all wabble saw work, but the curvature in

this case was so small as to be almost unnoticeable. In order to hold the work in position while using the saw a bolt was pushed up through the board on the table and into a vertical hole in the work.—Contributed by Experimenter.

Finishing Brasswork

Many readers have doubtless admired the very pretty effect of mottling seen on shop-made brass instruments, some-



For Mottling the Surface of Brasswork

thing like the veins in marble running over the surface of the brasswork. A smooth finished brass surface readily shows up scratches, and is difficult to lacquer perfectly, evenly and free from brush marks. On the mottled surface lack of skill is not so noticeable.

The "mottling" is really a series of very fine circles running into one another scratched on the surface of the brass, says a correspondent of the Model Engineer, who has done work of this kind in the following manner:

Take a small round piece of wood, Fig. 1 (a piece of a penholder or pencil will do), put it in a drill chuck or self-centering chuck, leaving an inch or so projecting. Start the lathe and with a smooth file make the end very slightly convex. From a piece of the very finest emery paper cut a circle about an inch or so in diameter, as shown at Fig. 2, and fasten to the piece of wood with good stout string, as shown in Fig. 3.

Now, holding the piece of brasswork in the right hand (it is necessary to have a piece of paper between the brass and the fingers, the grease from the fingers prevents lacquering afterwards), the work being finished to a good surface, run the lathe as fast as possible, press the work lightly against the emery-covered wood, moving it steadily forward at right angles, and a sort of shaded vein will be seen where the rotating emery has cut lightly into the brass. You may follow any pattern you please at first, but the worker will soon be able to obtain some very nice results, and designs will suggest themselves to him.

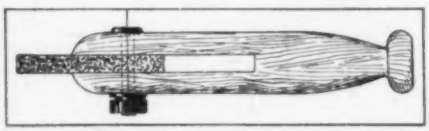
If two or three diameters of wood are used, the veining may be of different widths. Different grades of emery may also be used, but anything like a coarse grain is useless. Do not use emery cloth, use only the finest emery paper, such as is used for polishing.

To Keep Hot Lead From Sticking

Prepare a mixture of 1 qt. powdered charcoal, ½ pt. salt, 1 gill yellow prussiate of potash and a lump of cyanide of potassium the size of a walnut, says Machinery. Apply this to the surface of the pot or to tools to be heated in the molten metal.

Eraser Holder

Draughtsmen will find this device very handy and well worth the trouble of making, especially if there is much rubbing out to be done. It is made from an ordinary clothes pin cut down



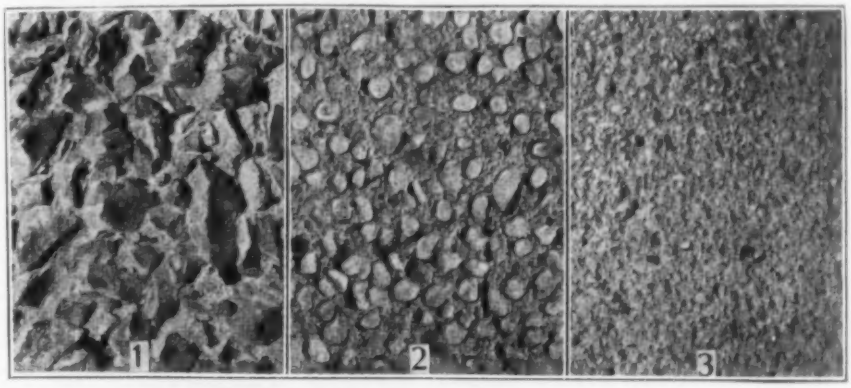
Eraser Holder

as shown and drilled to receive an old binding-post, which is used to hold the eraser from turning. I have used this device for some time and find that it makes the work of rubbing out much easier and prevents the fingers from cramping.—Contributed by Wm. E. Jehn, 195 Fifth Ave., Paterson, N. J.

Surface Finish For Concrete

In considering concrete as a substitute for brick and stone, perhaps the most serious problem confronting the architect is to obtain a satisfactory surface or finish.

composed of 1 part cement, 2 parts sand and 3 parts ¾-in. screened stone; Fig 2 consists of 1 part cement, 2 parts sand and 3 parts ⅜-in. pebbles; Fig. 3, 1 part cement and 3 parts yellow bar sand. Each example is shown at its actual size.



Examples of Surface Finishing for Concrete--Actual Size

The concrete surfaces shown in the accompanying photographs are easily obtained by a method known as the Quimby process, which is described in the Cement Age as follows:

The process consists in completely flushing the face against the form, removing the form after the material has set but while it is still friable, and then immediately washing and rinsing the surface with water.

The washing removes the film of cement which has formed against the mold and exposes the particles of sand and stone. The appearance then depends, of course, upon the character of the aggregate in the concrete and the uniformity of its distribution in the mixtures. As in well mixed concrete the cement merely fills the voids between the grains of sand, and the sand fills the voids between the pebbles or particles of crushed stone, the cement visible in this finished surface is so small a percentage that it has very little influence on the color of the work.

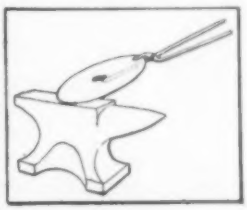
In the illustration the surface shown in Fig. 1 was obtained with a concrete

To Produce Extreme Hardness in Steel

Heat the steel slightly, then immerse in a mixture of 4 parts water, 2 parts salt and 1 part flour, till it is thoroughly coated. Then heat the metal to a cherry red, says Machinery, and plunge in soft water.

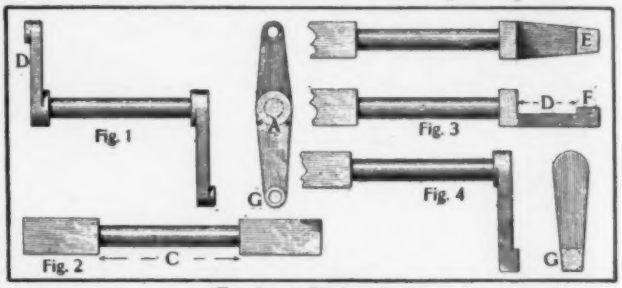
Tongs For Pulverizer Discs

A very useful pair of tongs for holding pulverizer discs when sharpening same can be made as shown in the sketch. If an old pair of tongs can be spared for the purpose the labor of altering them for work of this kind will be very little, as it is only necessary to weld a piece of round stock on one of the jaws and turn up the end as shown.—Contributed by Geo. G. McVicker, North Bend, Neb.



Forging a Rocker Arm

To forge a rocker arm take round stock that is large enough to give, when flattened, the dimension shown at A, Fig. 1. Draw it to the form shown in Fig. 2. This will require great care, says a correspondent of the Blacksmith and Wheelwright, for there is danger that the dimensions C may be too great or too small. Flatten enough of one end to form the arm and draw to the form shown by two views in Fig. 3. Make the dimension D of this view to correspond to D in Fig. 1. In flattening this part the work is done with the hammer, the side toward which the stock is drawn being made as true and flat as possible from the shoulder to the end, forming the recess at D by the use of the fuller. This leaves the projection at F on the end, from which to form the boss. Next clamp the piece firmly near one shoulder and bend the flattened portion down, making the whole piece of the form shown in Fig. 4. This may be done by clamping the piece between the hammer dies and driving the arm down with the sledge hammer. Round the boss to the shape shown at G in Fig. 1. This rocker arm is strong and durable.



Forging a Rocker Arm

To Recharge Motorcycle Batteries

When a motorcyclist finds himself in the country with his batteries run down they may be revived sufficiently for the return trip, or till new cells can be procured, by the following treatment: On each side of the carbon pole drill a small hole with a pocket knife or screw driver, drilling deep enough to go entirely through the black composition on the top. Then pour water in the holes and allow batteries to stand about 5 minutes.—Contributed by Eugene J. Friedlander, 2803 Second Ave. So., Minneapolis, Minn.

Loading Stern-Wheel Boat

In loading a stern-wheel paddle boat for all ordinary conditions, it is usually best to stow the cargo so that the boat will trim a trifle down at the head, and therefore draw a trifle more water at the bow than at the stern. This not only assists towards higher speed and easy running, but is also a precaution against grounding, as the boat, if running on to a shoal place, touches forward, and is then easily backed off without damage to the paddle-wheel.

Talking Through Your Chest

Persons not familiar with the action of the vocal organs derive considerable amusement from carrying on a telephone conversation with the transmitter placed against their chests. With the instrument in this position the sound transmitted is reproduced with a loudness almost equal to that heard when the mouthpiece is immediately in front of the lips of the speaker. The voice of the speaker may be readily recognized, says the American Telephone Journal, but there is sufficient alteration in the quality of tones to make it possible for a change from this position to the customary one to be readily detected.

Desk set users will do well not to attempt to muffle a transmitter by

pressing it against their coats, as is sometimes done by persons who use the telephone while standing, if they wish to say things which should not be heard at the other end of the line.

How to Mix Plaster of Paris

In mixing plaster of paris do not pour the water on the plaster, but turn the plaster gradually into the water, says Machinery, spreading it about in shaking it in and not stirring until all the plaster has been added. If mixed in this manner a smooth cream or thin dough without lumps will result. The proper quantity of gypsum is usually enough to peep out over the surface of the water over the greater part of the area; that is, about equal volumes of each ingredient. The addition of glue water to the mixture retards setting.

Life of Wooden Poles

The German Postal and Telegraph Department has recently published statistics collected during the period of 52 years on the life of wooden posts impregnated with different preservative substances. The number of posts under observation amounts to nearly 3,000,000 and the following are the average results obtained:

Poles Impregnated with—	Length of Life.
Sulphate of copper	11.7 years
Corrosive sublimate	13.7 years
Creosote	20.6 years
Unimpregnated	7.7 years

The manner of preparing the poles has been improved from time to time, and this is clearly shown in a further table giving the average length of life of the poles under different methods of treatment with each preservative at different periods. For example, in 1883, with sulphate of copper the average life was 9.4 years, while in 1903 the method of treatment had been improved so that an average life of 13.3 years could be obtained.

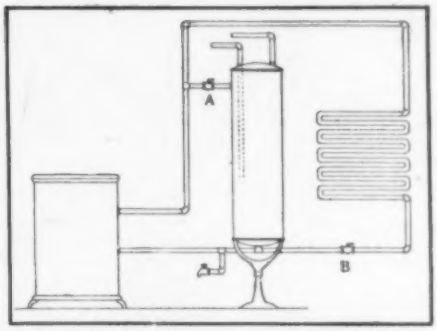
For common brass for castings use 20 parts copper, 2½ tin, 1¼ zinc.

Remedy for Stiff Working Springs

It frequently happens that wagon repairers are called upon to reduce the stiffness in the springs of new vehicles in which the springs are far too stiff for comfort. This is sometimes done by removing a plate; but a better way is to take spring apart, place each leaf, one at a time, in the vise and drawfile until all the scale has been removed. Then mix tallow and plumbago and paint the leaves and reassemble, wiping off all the tallow from the edge. The idea of using tallow is that even in warm weather it will never run out and disfigure the springs.—Contributed by J. C. Blake, Harvard, Ill.

Heating a Radiator from a Range Boiler

Unsuccessful attempts to heat radiators from hot water boilers are usually due to faulty installation. The sketch herewith shows the correct way to make the connections. Instead of using valves the stop cocks A and B are used, as they offer less resistance to circulation than ordinary globe valves. Cock A must be so arranged that it cannot be closed more than two-thirds, says a correspondent of Domestic Engineering, else if cock B and cock A were inadvertently closed tight at same time there would be danger of the waterback exploding. The operation would be as follows: By partly closing cock A any desired amount



Correct Installation of Pipes and Radiators

of the hot water could be forced through radiator, and by this means radiator could be kept up to the boiling point if desired, while boiler was anywhere from 100 to 120 or at any desired heat. By placing the sediment cock, as shown, the return can be kept clear of sediment. When it is desired to put the radiator out of commission it can be done by closing cock B.

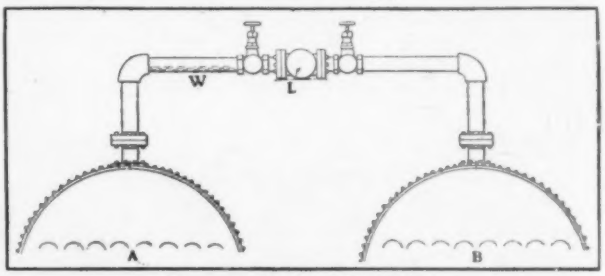
The hot water supply from boiler and from heater to radiator should be run entirely separate, as shown in the sketch.

Cutting in a Boiler

If the following precautions are observed many of the accidents which occur from cutting in boilers will be prevented. Let A and B represent two boilers; B is supplying steam to the line, L; A is about to be cut in, and the pressure in it is nearly up to the required amount.

Now it is possible that some water, W, may have collected in the pipe leading from boiler A. If there is enough of it, the engine might be wrecked when the stop-valve is opened. The secret of preventing trouble consists in opening the valve when the steam is about 5 lb. lower in boiler A than it is in the main line; then any water that may have collected in the pipe will be forced back into boiler A; but be sure and open the stop-valve very slowly, and be sure that you know how nearly correct the steam gauges are.

Also, in cutting in a boiler where there is a condensing engine, be careful that all the air is blown out of the boiler first, says a correspondent of Power, otherwise it would plug up the condenser and the vacuum would be lost.



Danger of Wrecking the Engine

Anybody can publish a Webster's Dictionary now: Copyright expired.

Cinder Roads Bad for Planing Mills

It is poor economy to make cinder roads around a planing mill, says a correspondent of Wood Craft, who has found that some of the cinders are sure to work their way into the ends and surface of the lumber and make it necessary to keep one man busy filing the nicks out of the planer blades.

Ink for Rubber Stamps

A very good rubber stamp ink which will not rot the rubber, dry on the pad or give bronzed colors can be made by mixing the following: 16 fl. oz. alcohol; 12 fl. oz. glycerine; 1 oz. aniline violet. Dissolve the aniline in the alcohol first and then add the glycerine.

To Remove Wheel Stuck on Shaft

Many times a wheel which has been machined for a running fit on a shaft runs dry of oil and begins cutting. This usually results in the formation of one or more small balls which roll up the material in the same manner that boys roll snow balls, until they become wedged in so tightly that the wheel is locked to the shaft. To remove the wheel apply kerosene, allowing it to soak in thoroughly. If this fails, try heating the hub with a gasoline blow-torch, and if this fails, too, it will probably be necessary to use jack-screws and chains.—Contributed by G. G. M.

A cube of air 31 ft. on each side weighs over a ton.

To Color Brass Black

Boil the brass to be blackened in a strong potash solution to remove all grease and oil, then rinse well. Dissolve 1 lb. plastic carbonate of copper in 2 gal. strong ammonia and dip the brass in this solution, which should be heated to 150° to 175° F., until the desired degree of blackness is acquired. This process, says Compressed Air, works best on brass containing much copper. The color is uniform and has little tendency to peel off.

The plastic carbonate of copper can be made as follows: Dissolve blue vitriol in hot water and add a strong solution of common washing soda so long as any precipitate forms. Allow the precipitate to settle and then pour off the clear liquid. Add hot water and allow to settle again. Pour off the clear water again, add hot water, let settle and pour off as before, repeating this process until everything has been washed out of the green carbonate of copper that remains at the bottom of the vessel and which is the plastic carbonate of copper referred to.

A Good Copying Ink

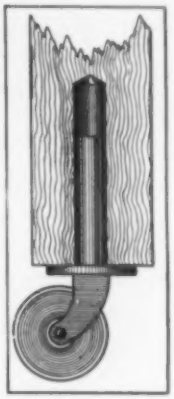
Into two gallons of clear rainwater put ¼ lb. gum arabic, ¼ lb. clean copperas (ferrous sulphate), ¾ lb. powdered nutgalls, ¼ lb. brown sugar. Mix well, shake occasionally for ten days, and strain. If it is needed before ten days steep it in an iron kettle until the desired strength is obtained.

Liquid Glues

Take three parts (by weight) of gum shellac and one part India rubber. Dissolve in separate vessels in ether (free from alcohol), applying a gentle heat. When both are entirely dissolved mix them and put them in a tightly corked bottle. This variety of glue is known as marine glue. It resists the action of hot and cold water and the majority of the alkalis and acids.

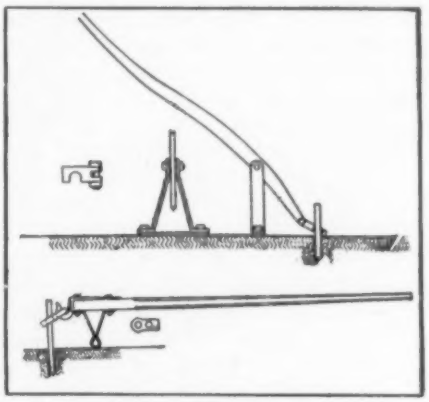
Repair for Caster Sockets

When the caster socket in an article of furniture becomes worn or weakened, drill out the socket large enough to receive a piece of ⅛-in. pipe and after driving the pipe in as far as it will go cut it off with a hacksaw. If the caster has a large shank, it may be necessary to use a ¼-in. pipe. A piece of pipe fitted in this way makes an excellent bushing and is much more durable than the original socket.—Contributed by Axsul Everson, Penn Yan, New York.



Stake Puller

The device illustrated is used for pulling iron stakes or rods out of paved and other streets and was designed by R. S. Miller, manager of the Gas Co., Muncie, Ind. In this case the handle is made of iron, about ⅜x2 in., which also answers for the stand or rest. It may be noticed that the stand has two sharpened studbolts to prevent same from slipping when setting the device preparatory to pulling a rod. The



Stake Puller in Operation

toggle is made of forged steel and the opening will take any sized rod by simply varying the angle at which it is applied. This device pulls rods from ½ in. to 1¼ in. with ease, even in well macadamised streets, without in any way disturbing the pavement.

Metal Polish

A good polish for silver, gold or other fine metals is made by mixing a little vaseline with the ashes of burned out or broken gas mantles. Apply with a rag or finger and polish with a clean rag. The result is a superb luster, the best finish being obtained by using a soft rag.—Contributed by Herman Pardeck, 102 Rees St., Chicago.

Keeping a Circular Saw Cool

To keep a saw from heating, the saw teeth and gauge should be suitable to the wood, and the saw should be well sharpened and run at the proper speed. The saw blade should be carefully packed, the feed not crowded and the cut opened out immediately it passes the saw. The saw guide is sometimes continued too far along the face of the saw, and thus crowds and heats the plate through not allowing sufficient room for the wood to open out as it is cut. If the fence extends say 3 in. beyond the roots of the teeth, it is usually enough. Heat is often communicated to a saw through the saw spindle, through the bearings being out of order or screwed up too tight, says Timber Trade Journal. The saw should not fit too tightly on the saw spindle or bind the steady pin. A saw when hung properly should in the horizontal line incline very slightly toward the timber, so that the teeth at the back of the saw may rise without scoring the wood. If the driving pulleys are too small or run at too short centers the bearings will heat.

Average Weight of Telephone Poles

A committee of pole experts reported at a recent convention of dealers the following average weight of poles:

			Pounds.
6	in.	20 ft.	190
7	in.	40 ft.	850
6	in.	45 ft.	900
7	in.	45 ft.	1,100
6	in.	50 ft.	1,150
7	in.	50 ft.	1,350
7	in.	55 ft.	1,700
7	in.	60 ft.	2,200
7	in.	65 ft.	2,500
7	in.	70 ft.	3,000

Strength of Grindstones—Wet and Dry

Tests seem to indicate that the strength of a grindstone is considerably reduced when it is wet, says Iron Age. The wetting not only decreases the tensile strength of the material, but it adds weight and thus augments the centrifugal pull at a given peripheral speed. The reduction of strength appears to be as much as 40 or 50 per cent. A dry section of stone broke under a stress of 146 lb. per square inch. Another section of the same stone, soaked over night in water, broke at 80 lb. A better stone, under the same conditions, broke under stresses of 186 lb. per square inch when dry and 116 lb. when wet. Much difference of opinion prevails as to the maximum safe allowable speed at which to operate the stones. Some grinders use a peripheral speed as high as 4,500 ft. per minute, while others limit it to 2,500 ft. Little difference is observed in the liability to breakage, this leading to the conclusion that a frequent cause of breakage must be hidden in flaws or cracks, which would permit the disruption of the stones at the lower speeds.

An Excellent Tracing Paper

Make a mixture of turpentine and mastic varnish in equal parts and apply to separate sheets of double crown tissue paper.

Rate of Evaporation of Alcohol, Turpentine, Benzine, Etc.

In an address before the National Painters' Association, W. G. Scott said:

From the result of many experiments it has been found that the "rate of evaporation" per hour, per square inch, for a given volume of water, alcohol, turpentine, and benzine is as follows:

	Per cent (by weight).
Water	0.61
Grain Alcohol	5.10
Wood alcohol	9.74
Turpentine	1.10
Wood Spirit	1.58
Benzine	4.70
Gasoline, 87 deg.	55.11

When paint works "short" or varnish refuses to "level out," the trouble is generally due to the amount and kind of vehicle present. A varnish with the proper amount of turpentine will flow and level out much better than one containing the same amount of benzine, the more volatile thinner causing it to set quicker. This also explains the difference so often noticed in shellac varnishes where wood in place of grain alcohol is used as a thinner.

Benzine has the highest rate of evaporation of all the paint thinners, even higher than the very inflammable coal tar product known as "solvent naphtha," which is 2.23 per cent. The study of evaporation is a complex problem, of which little is known, but it is to blame for many of the troubles incident to paint and varnish.

Slow evaporation generally means slow drying; rapid evaporation should mean quick drying, but more often signifies quick setting.

A very peculiar feature in regard to evaporation and the drying of paint and varnish is, that the rate of evaporation at a high temperature in a closed room is not nearly so great as at a lower temperature with a free circulation of air.

Water is compressed 1/326100 of its volume for each pound of pressure.

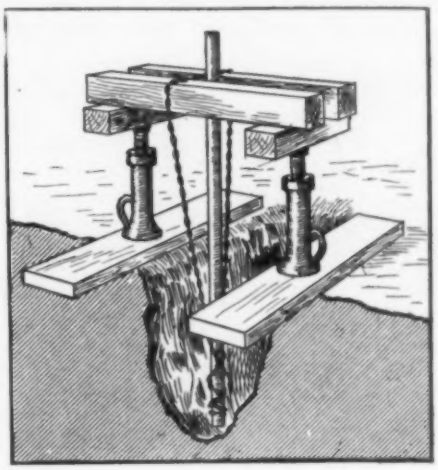
Shrinkage of Metal Castings

The following table gives the rate of shrinkage in castings made from various metals:

Bismuth	5-32 in. per foot
Pipes	1-8 " " "
Tin	1-4 " " "
Copper	3-16 " " "
Lead	5-16 " " "
Zinc	5-16 " " "
Tain brass	1-8 " in 9 in.
Tuick brass	1-8 " " 10 "

Extracting Pump Pipes

It is often necessary to pull the pump pipe from an old well either for renewing the strainer or for making other repairs, and as this is usually a



A Good Pipe Puller

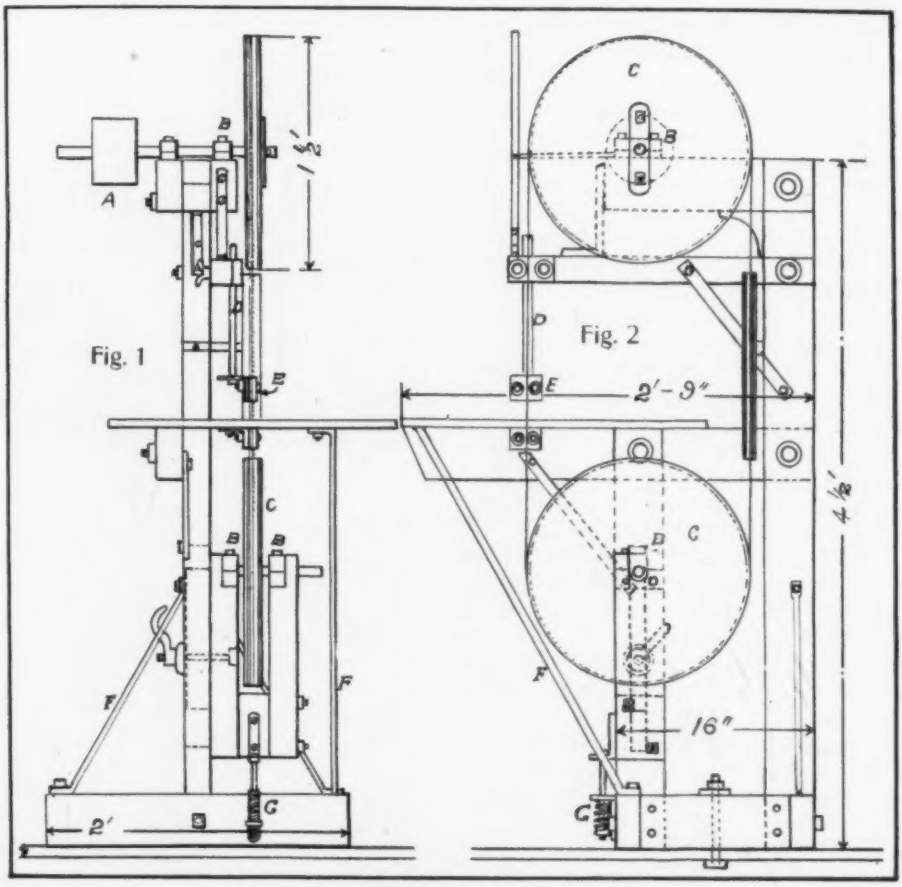
difficult undertaking, the scheme here illustrated may possibly be beneficial to some readers. A small excavation is made and a chain is wrapped around the pipe, which, being usually somewhat rusty, prevents the chain slipping.

The timbers and jackscrews are then placed as shown and the jackscrews turned up to their full height. They are then lowered; the chain is moved down on the pipe and the jackscrews turned up again, this operation being repeated as many times as is necessary to remove the pipe.

How to Make a Home-Made Band-Saw

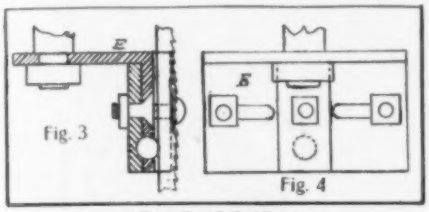
The frame of this machine is made of 2-in. by 4-in. lumber bolted together with ½-in. bolts and reinforced with iron rods. The band-wheels are each made from a single piece of oak 2 in. thick. They were first sawed out in 18-in. circles and then mounted on the shafts and turned up perfectly true. A groove ⅛ in. deep and 1¼ in. wide was then turned on the face of each pulley and a piece of rubber belting 1¼ in. wide was then fastened in the groove by means of small nails driven along both edges.

The guides were made by bending 2-in. band iron into L-shaped pieces, as shown in Figs. 3 and 4. The top guide is fastened to a ⅝-in. rod, which works in a clamp fastened to the frame. A cavity is made in the guide to receive the steel ball, B, which may be taken from an old bicycle. On each side of the ball are placed blocks of wood, fastened by means of small bolts passed through slots. This allows the blocks to be moved up on the saw as they wear. The lower guide is the same as the upper except that it is bolted fast to the under side of the table. The saw runs through these guides, which prevent it bending and the ball-bearing at the back keeps the saw from running off the pulleys. The saw blade is 10 ft. long and will cut



Front and Side Elevation of Band-Saw Machine

to the center of a 3-ft. circle. The general dimensions of this band-saw



Details of Guides

are given in the elevation drawings, Figs. 1 and 2.—Contributed by Frank W. Rumsey, New London, O.

How to Hang Japanese Leather

Japanese leather, like ordinary pressed or embossed paper, can't be satisfactorily laid on hard walls without they are first lined with brown paper, which gives the paste an absorbent surface and a surface to stick to. Use ordinary wheat flour for the lining paper, but for the Japanese leather paper, as well as for all the heavy papers, use a stiffer paste, which sets quicker, and lessens the risk of soaking into and softening the relief work and injuring the colors. Carefully trim each piece of Japanese paper with the knife and by the straightedge, says the Master Painter. Apply the paste quickly, and get the paper onto the wall as soon as you can. When you have the paper in its place on the wall, go over it with a very soft brush, though some think that even the soft brush is wrong, and that the fingers only should be used. When the paper has become very nearly dry, go over the seams with the seam roller, very carefully. Be very careful not to stretch the paper while it is wet. Remove at once any paste that may press out from the seams.

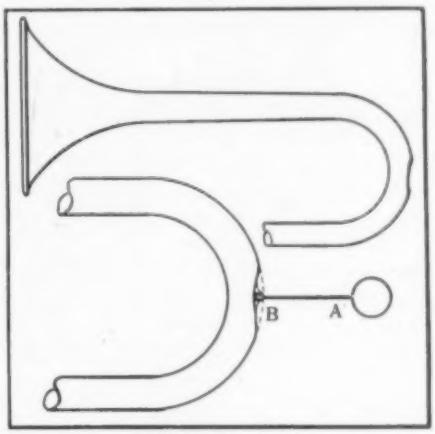
A good cement for such articles as shells, fossils, etc., consists of beeswax, 1 oz.; resin, 4 oz.; powdered plaster-of-paris, 5 oz., melted together. Warm edges of specimen and apply cement warm.

Temperatures of Flames

According to the results of recent experiments the flame of acetylene is perhaps the hottest known except that of the electric arc. The following figures have been given by Mr. Maffi: Bunsen burner, 1871°; acetylene flame, 2548°; alcohol flame, 1705°; Denayrouze burner, half alcohol, half petroleum, 2053°; hydrogen flame, in air, 1900°; gas jet flame, with oxygen, 2200°; oxyhydrogen flame, 2420°. These are all Centigrade degrees.

To Repair Dent in Musical Instrument

Cornets, trumpets and similar instruments frequently become dented, as shown in the sketch. When this happens bend a wire to the form shown at A and soft solder to the dent at B. Then simply pull on the wire, thus



Taking Out a Dent

bringing the dent out to its original position, as indicated by the dotted line. Then apply sufficient heat to melt the solder; wipe off clean with a rag and polish.—Contributed by C. R. McGahey, Atlanta, Ga.

A tight belt is a power-consumer and a slipping belt is a speed-loser, but between the two there is a good point where you don't lose any speed and don't consume too much power.

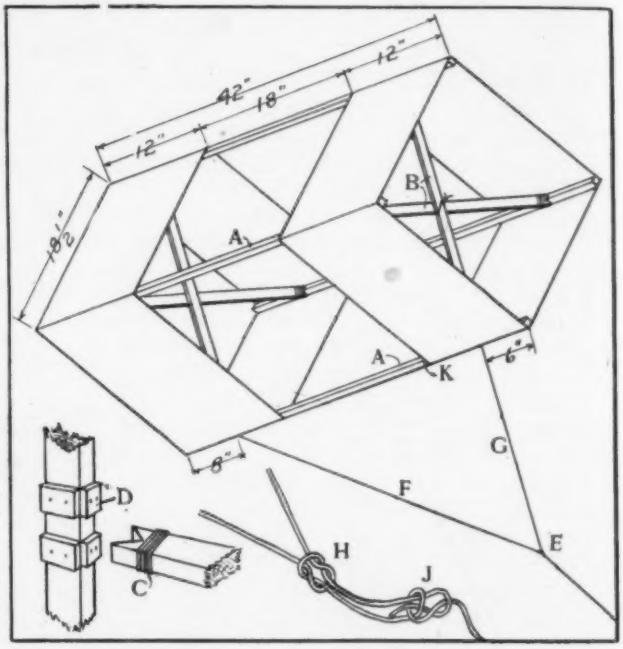
Amateur Mechanics

HOW TO MAKE A BOX KITE

As some of the readers of this magazine may desire to build a box kite, a simple method of constructing one of the modern type is given in detail as follows: The sticks should be made of straight-grained wood, which may be either spruce, basswood, or white pine. The longitudinal corner spines, A A, should be $\frac{3}{8}$ in. square by 42 in. long, and the four diagonal struts, B, should be $\frac{1}{4}$ in. by $\frac{1}{2}$ in. and about 26 in. long.

Two cloth bands should be made to the exact dimensions given in the sketch and fastened to the four longitudinal sticks with 1 oz. tacks. It is well to mark the positions of the sticks on the cloth bands, either with a soft lead pencil or crayon, in order to have the four sides of each band exactly equal. The ends of the bands should be lapped over at least $\frac{1}{2}$ in. and sewed double to give extra strength, and the edges should be carefully hemmed, making the width, when finished, exactly 12 in. Probably the best cloth for this purpose is nainsook, although lonsdale cambric or lightweight percaline will answer nearly as well.

The diagonal struts, B, should be cut a little too long, so that they will be slightly bowed when put in position, thus holding the cloth out taut and flat. They should be tied together at the points of intersection and the ends should be wound with coarse harness maker's thread, as shown at C, to prevent splitting. The small guards, D, are nailed or glued to the longitudinal sticks to prevent the struts slipping out of position. Of course the ends of the struts could be fastened to the longitudinal strips if desired, but if made as described the kite may be readily taken apart and rolled up for convenience in carrying.



The bridle knots, E, are shown in detail at H and J. H is a square knot, which may be easily loosened and shifted to a different position on the bridle, thus adjusting the lengths of F and G. A bowline knot should be tied at J, as shown, to prevent slipping. If the kite is used in a light wind, loosen the square knot and shift nearer to G, thus shortening G and lengthening F, and if a strong wind is blowing, shift towards F, thereby lengthening G and making F shorter. In a very strong wind do not use the

bridle, but fasten a string securely to the stick at K.—Contributed by Edw. E. Harbert, kite expert, 1627 Briar Place, Chicago.

Pictures Without a Camera

If you wish to take a picture and have no camera, but would like to gain a little experience in finishing up, you can make some very nice pictures by the following method. Or, if you have a proof and have broken your plate after you took that proof, you can make another one, about as good as the original, without taking the picture over. Of course, it is not possible to take an out-door scene without a camera of some sort, as exposing the plate to the light ruins it, and no image is found, but you can take pictures of other pictures without a camera.

All you need is a dry plate, a printing frame, the size or larger than the picture you wish to take, and the usual developing outfit. Cut a picture, with nothing on the other side, out of a magazine, or take any ordinary camera picture, not mounted—this we will take our picture of.

In your printing frame place a piece of very clean glass the size of the frame; an old plate from which the gelatine has been removed by hot water is best. Place your picture in the frame on top of the glass, face up. (Better results will be had if the picture is oiled with kerosene on the back side, but don't let oil get on plate.) Then lay your plate with the sensitive side next to the face of your picture, put in the frame back, as you would in printing a picture, and fasten it tight. Of course, this is done in the dark room. Now you are all ready for the exposure. After a little practice you will have no trouble in judging the time. It depends upon the picture, the light and the plate. The best way

Made Without Camera

Experiment With Colored Electric Lamps

To many the following experiment may be much more easily performed than explained: Place the hand or other object in the light coming from two incandescent lamps, one red and one white, placed about a foot apart and allow the shadow to fall on a white screen such as a table cloth. Portions of the shadow will then appear to be a bright green. A similar experiment consists in first turning on the red light for about a minute and then turning it off at the same time that the white one is turned on. The entire screen will then appear to be a vivid green for about one second, after which it assumes its normal color.

is to open the little window of your dark room and expose the frame about a second in the subdued daylight. Remove the plate carefully and develop in the usual way. There will be a negative of the picture you had at first, if you have been successful, if not, you should try it a time or two, varying the time of exposure.

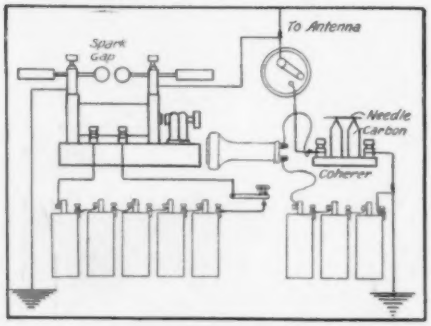
In this manner you can make many pretty blue prints for your wall, or supply yourself with postal pictures of things impossible for you to take a picture of yourself.

Should you have trouble with your high lights, print rather dark and bleach in following solution:

Water, 100 cc.
Potassium Ferricyanide (1/10 sol.), 3 cc.
Hypo (1/10 sol.), 20 cc.

Wireless Telegraph

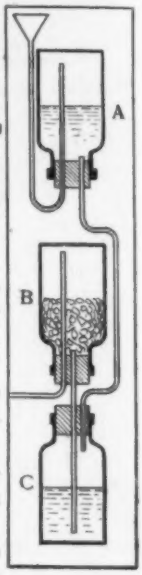
The accompanying diagrams show a wireless telegraph system that I have used successfully for signaling a distance of 3,000 ft. The transmitter consists of an induction coil, about the size used for automobiles, a key or push button for completing the circuit and five dry batteries. The small single point switch is left open as shown when sending a message, but when receiving it should be closed in order that the electric waves from the antenna may pass through the coherer. The coherer in this case is simply two electric light carbons sharpened to a wedge at one end with a needle connecting the two, as shown. An ordinary telephone receiver is connected in series with the coherer, as shown. To receive messages hold the receiver to the ear and close the switch and answer by opening the switch and operating the key.—Contributed by Coulson Glick, 816 N. Temple Ave., Indianapolis, Ind.



Wiring Diagram for Wireless Telegraph

Constant Pressure Hydrogen Generator

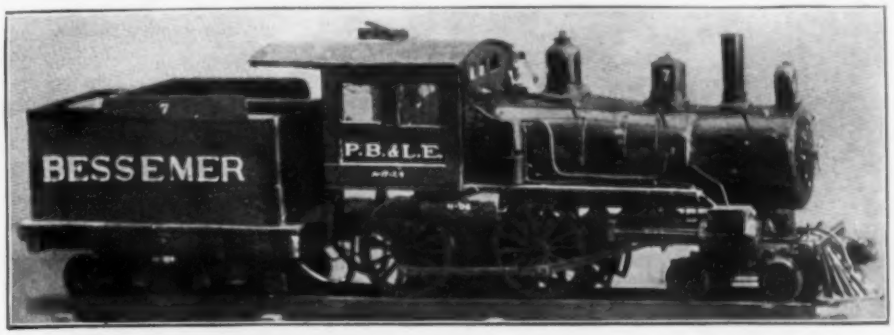
By fitting three bottles, A, B, C, with rubber stoppers and connecting with glass tubes as shown in the sketch, hydrogen or other gases produced in a similar manner may be generated under constant pressure. In making hydrogen, bottle B is partly filled with zinc nodules formed by slowly pouring melted zinc into water. Hydrochloric acid is then poured in the small funnel, thus partly filling bottles A and C. When the acid rising from C comes in contact with the zinc, hydrogen gas is generated and fills bottle B. The gas continues to generate until the pressure is sufficient to force the acid back down the tube into bottle C, when the action ceases. As fast as the gas is used the acid rises in the tube and generates more, thus keeping the pressure nearly constant, the pressure depending on the difference between the levels of the acid in bottle A and bottle B. As this device is easily upset, a ring stand should be used to prevent its being broken, or if it is to be a permanent apparatus it may be mounted on a substantial wooden base. This apparatus may also be used for preparing acetylene gas or almost any gas which requires a mixture of a solid and liquid in its preparation.—Contributed by C. S. J., Detroit, Mich.



MODEL LOCOMOTIVE

The illustration shows a model locomotive built by Roy C. Beaver, a student in the Greenville (Pa.) High School. This model, which is built almost entirely of wood, required 20 months' time for its construction and was made from pencil sketches, drawn from a Bessemer and Lake Erie locomotive.

All the parts were worked out in detail, including the link motions and other moving parts, and when moved along the track it runs very smoothly.



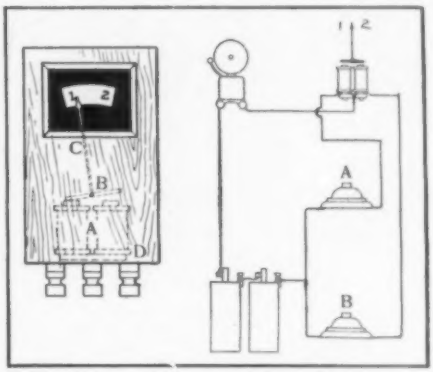
Model Locomotive Made by Roy C. Beaver

DIMENSIONS—Cylinder, 2½ in. by 1½ in.; valve travel, ¾ in.; fire box, 4 in. by 6 in.; diameter of boiler, smallest ring, 5½ in.; diameter driving wheels, 5 in.; height to top of stack, 13½ in.; length of engine and tender, 48 in.

HOME-MADE ANNUNCIATOR

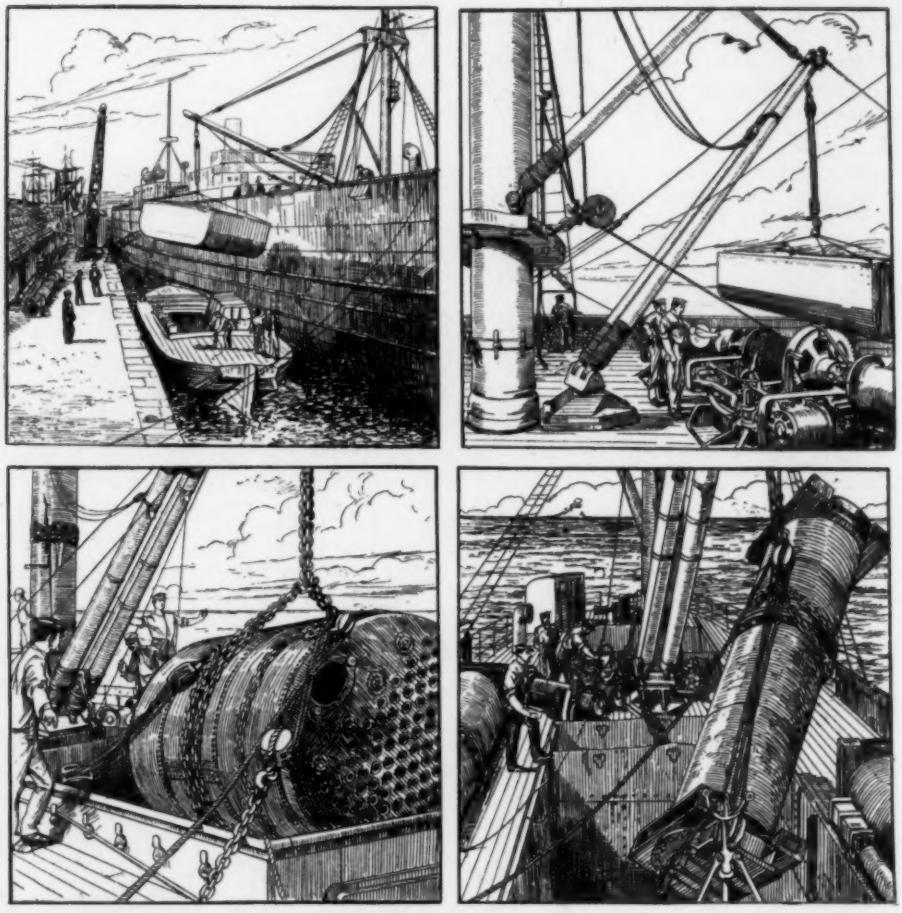
When one electric bell is operated from two push buttons it is impossible to tell which of the two push buttons is being operated unless an annunciator or similar device is used. A very simple annunciator for indicating two numbers can be made from a small box, Fig. 1, with an electric bell magnet, A, fastened in the bottom. The armature, B, is pivoted in the center by means of a small piece of wire and has an indicator or hand, C, which moves to either right or left, depending on which half of the magnet is magnetized. If the back armature, D, of the magnet is removed the moving armature will work better, as this will prevent the magnetism from acting on both ends of the armature.

The wiring diagram, Fig. 2, shows how the connections are to be made. If the push button A is closed the bell will ring and the pointer will point at 1, while the closing of the push button B will ring the bell and move the pointer to 2.—Contributed by H. S. Bott, 109 Cooper St., Beverly, N. J.



Annunciator and Wiring Diagram

Experiments are being made with brown sugar which is said to greatly increase the adhesive properties of mortar. Equal parts of sand and lime are mixed.



The above views show a type of ship derrick much used on English freighters. The machine will lift weights up to 25 tons.

TO BRING CITY WATER 226 MILES

The city of Los Angeles plans to build what will be the finest system of city water supply in the world. From away up in the pure, cold mountain tops of the Sierras, 226 miles away, the water from melting snows is to be conducted through a great conduit to the city, providing a daily supply of 250,000,000 gal. Not all of this is now needed for domestic purposes, for many millions of gallons are and will be required for irrigation purposes in the city and suburbs.

A mountain reservoir containing at all times 85,000,000,000 gal. will insure an abundant and constant supply. The revenue from water which can be sold at the present time is said to be sufficient to pay the interest on the $25,000,000 which the undertaking will cost.

An electric bath in which the patient is deluged with electric sparks a foot long, is announced to work wonders by the celebrated French scientists, Dr. Moultier and Professor d'Arsonval. Hardening of the arteries, cerebral hemorrhage and heart lesions are declared to yield to the treatment.